I. P.

I. P. File No. 47 1940 —4/.

I. P 47/40
1-5-85

Previous reference :

Ite 266/35-(1-2)

Later reference :

Ite 184/40-(1-4)

GEN. & REV. SECRETARIAT

Board of Scientific and Industrial Research.

Manufacture of Potamin Permanganate.

V 140.-
E

INDUSTRIAL RESEARCH BOARD.

BOARD OF INDUSTRIES AND COMMERCE.

Subject. Manufacture of Potassium Permanganate.

J.F. 47/40-1 File No. IR 182/40-1 of one file 19 Dated, 20th Decr. 1940.

DEC 23 1940
6443

'H'

Submitted.

1) Letter No. 9652-36 dated 17th December 1940 of the Director of Geology is put up for kind perusal.

2) He has intimated that the final note submitted by Mr Chandrakanta, on the results of investigations and his scheme for taking up production of Potassium Permanganate on a small scale at Belagula is being scrutinised by a special committee, as directed by Government

3) He further states that the Research Scholar of the Indian Institute of Science (working on the problem of the manufacture of Potassium Permanganate) who was requested to associate himself with this work is not in touch with him.

4) The Director of Geology will be requested to forward the final note and scheme of Mr. Chandrakanta, and also the decisions of the Special Committee, for consideration of the Board

Secretary,
Industrial Research Board. 20/12

CHAIRMAN) 22/12/40

S. T. PATHROJ ... 57/40-1 24/12/40

6) Draft of Joint Letter to Dr of Geology submitted for favour of appl.
24/12/40. 7)
Secretary) 27/12

27/12

NOTE—Contn. Sheet.

WD 06643—GPB—500—20-5-40

NOTE.

Subject Manufacture of Potassium Permanganate

File No. of 19

JAN 10 1941 6918

Permanganate. The Director of Geology will be a Member and Convenor of this Committee. He will be intimated as above, and requested to keep the Board informed of developments.

Secretary.

CHAIRMAN) 13) 10/1/41 13/1

INDUSTRIAL RESEARCH BOARD 13/1/41 No. 122 Date 13/1 BANGALORE.

14) Draft of Jain letter. Subtd 15/1/41

15) Secy.) 16/1 Issued on 16/1/41

'S'

OFFICE OF THE SECRETARY INDUSTRIAL RESEARCH BOARD. No. 330/40-1 Date 22/1/41 BANGALORE.

16) A copy of the extract from the note of Mr.Chandrakanta, received from the Director of Geology in Mysore, on the manufacture of -- Potassium Permanganate, is herewith put up for kind perusal.

17) It is made out from the report that the manufacture of this chemical from Mysore Pyrolusite can be profitably exploited in the State. The percentage of profits on the total investment

 WD 01345—GPB—750 -7-1-41

NOTE.

Subject Manufacture of Potassium Permanganate

File No. of 19 .

investment of Rs75,000/- is calculated at 20% on the investment (based on pre-war rates). It is estimated that on an average Rs2-3 lakhs worth of materials can be marketted annually.

18) The report of the Special Committee on this subject is awaited.

22/1/41. Secretary. 22/1

JAN 24 1941 7397

CHAIRMAN) 19) 26/1/41

20) 28.1.41

OFFICE OF THE SECRETARY INDUSTRIAL RESEARCH BOARD No 165 Date 28/1/41 BANGALORE.

OFFICE OF THE SECRETARY INDUSTRIAL RESEARCH BOARD No 414/40 Date 4/2/41 One file BANGALORE.

'L'

21) The "Potassium Permanganate" Committee met on the 30th January 1941. The minutes of the meeting received from the Director of Geology is herein enclosed for kind perusal.

22) The Committee have resolved that in view of the limited demand, for potassium permanganate in India, at present, it is not advisable to take up the scheme independently. They have however suggested that the scheme may be forwarded to Government Bichromate

NOTE.

Subject Manufacture of Potassium Permanganate.

File No. of 19

FEB 5 1941
1884

Bichromate Factory, so that, if and when an opportunity occurs, the manufacture of this chemical may be taken up by them, as an extension of the work of the factory.

23) A report will be submitted to Government accordingly.

Secretary,
4/2

Dated, 4th February 1941.

OFFICE OF THE SECRETARY INDUSTRIAL RESEARCH BOARD
No. 215/40
Date 11/2/41
BANGALORE.

Chairman)

24) Nil
5/2/41
10/2

25) Draft & Fair letter to Govt enclosing a Copy of the Proceedings is put up
19/2

Sanctioned
26) Copy issued on 20/2/41.

NOTE.

Subject Manufacture of Potassium Permanganate

File No. of 19 .

27) Letter dated 1/8/41 from Mr. L.S. Chandrakanta, now Research Chemist of the Govt. Alipore Test House.

28) Requests for a copy of the report of the Sub Committee that examined this scheme for the manufacture of Potassium Permanganate.

29) Secy's orders.
"Comply".

30) The findings of the Committee are treated as Confidential. The Committee was Constituted by Govt to advise upon ~~on~~ the Scheme. Later on, as per orders of the Chairman, since the subject was engaged the attention of Board (while under formation), it was treated as a Sub Committee of the Board.

31) Mr. Chandrakanta was Specially employed in the Geological Dept. to Carry on

I. R. B. 8] INDUSTRIAL RESEARCH BOARD.

NOTE.

Subject .....

File No. of 19 .

investigations on the Subject.
He is now working in the Alipore
Test House.

32) Before Chairman's permission
could be obtained to send
a copy of the Sub-Committee
report it is necessary to
consult the Director of
Geology in the matter.
Submitted for orders

JB 18/8/41

33) Thanks. I was under
the impression that he wanted a copy of
his report; since he wants a copy of the
findings of the Sub-Committee, he may
be informed that they are confidential
matters, but as such it is not possible
to send him copies.

18/8

Secret file on the
Subject need not be placed
before the Board on
8.9.41. File
returned to Dr. Roy
on 22/11/41.

34) Draft letter to Mr. L.S.
Chandrakanta for issue

JB 19/8/41

21/8

35) Issued 22/8/41

WD 01345—GDB—750 -7-1-41

Manufacture of Potassium Permanganate

BOARD OF INDUSTRIAL
PLANNING AND COORDINATION.

General and Revenue Secretariat | File No. | of 194 | [App. F. III-2

Serial No.

D.O letter No. C/-Eng 660/41.2 dated 22/23-6-42 from the Director of Ste enclosing a Copy of letter received by him from the Director of Ste, U.P. Cawnpore, on the subject.

2:+ The Director of Ste solicits instructions as to whether he can supply the details of the Scheme to the Director of Ste. U.P.

3:) The investigations were carried out in the Geological department and Mr. L.S. Chandrakanta was specially employed in the Dept for this purpose. The final report of Mr. Chandrakanta and the proceedings of the Sub-Committee are treated as "Confidential". In the Sub-Committee, the Director of Ste is also a member. Mr. Chandrakanta has left Mys Govt Service and is now in Alipore Test House

Kind reference is invited to Paras 30-33 of the note. The Dir of Geo is the Convenor of the Sub Committee.

NOTE—Cont. Sheet.

WD C4155—GPB—55,000—23-10-41

P.T.O.

Manufacture of Potassium Permanganate

BOARD OF INDUSTRIAL PLANNING AND COORDINATION.

File No. of 194 .

General and Revenue Secretariat

Serial No.

8) It is a point for order whether the Dir of Ind to enquire furnish the details of the Scheme to the Dir of Ind etc. U.P.

9) Subject for order.

Jh 24/6/42

40) Please obtain first up the file of Ind Dept.

Supt Ind 26/6/42

26/6/42

G.R.S. 121—3]

BOARD OF INDUSTRIAL PLANNING AND COORDINATION

ROUTINE NOTES

[To be used only for notes, requisitions, etc., not intended for permanent record.]

IMMEDIATE

41) Re Secty file abt Rev L. S. Chandrakanth's investigation re: Potassium Permanganate &c - Constitution of a Committee &c

42) A & F. Branch (Geological Survey) seems to have taken the file. It might be connected

43) Please refer to Go no D, 885-7/42 dtd 3.1.26 184-40-4/8/42 16/8/41

4) If agreed the file will be sent to the Secy of A & F Br to kindly send the Secty file immediately

SECRETARY. BOARD OF INDUSTRIAL PLANNING & COORDINATION. JUL 1 1942 No 1694/42

N. B.—Should routine notes be written on small slips, the notes must be copied on slips pasted on this form.

5) Consulted the file on the subject.

45) A & F Br) Director of Geology may kindly see the file on the above subject.

WD 078—GPB—30,000—25-7-42

Urgent

JB. 1694

47) The A & I Br have furnished
Refer to latest G.O. issued on the subject.

As per rules I also referred
to the Opn of the Dir of Eco & the
file is not available there.
They have however furnished
Refer to latest G.O. issued in this
matter, the No. and date of which
have already been noted on the
reverse of the A & I Br
Furnished.

JB 1/7/92

48) DPC
To submit the
file back to the G.O.
mentioned above
for
1/7/92

Mr KR
1/7
[illegible]
[illegible]
[illegible] 31.12.91.

49) In spite of efforts made the required
file (Ste 184-90-4) has not become available.
Obtain.

JB 22/7

50) Submitted for instructions.

51) Refer Paras 38 & 39
of the notes.

JB 22/7/92

The file No. 184/90
Sale deed
received today.
JB 22/7 5.pm.

52) Further note submitted
as per instr.
JB 22/7

Serial No.

53) There is only one original copy of the final note & Scheme of Mr. L. S. Chandrakanta, Research Scholar specially appointed for the purpose in the Geological Dept. This Report is with the Director of Geology - Flag "N"

54) The Director of Geology has sent a copy of the extracts from the said Report Flag "N" which is placed in the file

55) The decision of this Special Sub Committee is also in the file Flag "O" & this decision was approved by the Board on 15. 3. 41. Flag "Q"

56) The findings of the Committee and the Scheme are treated as "Confidential". Said Reference is limited to Paras 30-33 & 37 of the note. It is very likely that the Dichromate factory to whom the Scheme has been referred as for the decision of the Committee & the Board may take up the work with advantage at an early opportunity. So far the details of the Scheme & findings of the Committee & of the Board have not been furnished to anyone

NOTE—Cont. Sheet.

WD 94155—GPB—55,000—23-10-41

Manufacture of potassium permanganate 1949

File No. of 194 — General and Revenue Secretariat

Serial No.

and there are no precedents in this behalf.

57) It is a point for orders, whether in view of the above circumstances, the Director of Ste might furnish the details of the scheme to the Director of Ste U.P. - Refer: P.W.D. for orders.

58) The connected file is also linked

JH3 23/7/49

For 23/7/49

60)

Dev Secy

59) The Scheme has not yet assumed a final shape.; it may not be desirable to furnish Details. The Dir I×C may find a suitable reply to the Dir I×C. United Prov.

Yes Ste 23/7

Min. I×R)

UP 24/7/49

For 24/7

OFFICE OF THE MINISTER FOR FINANCE & REVENUE 24 JULY 1949 No 776

UP 27/7

For 27/7

61)

Draft letter submitted for appl. If appd, a copy of this letter will be sent to the Dir of Geo, Convenor of the Sub Committee for his information etc.

62) Yes Ste

JH3 27/7/49

63) For 28/7/49

Manufacture of Potassium Permanganate

Serial No.

Confl

To the Dir of Dte
Intimated that the details of the Scheme need not be furnished in the circumstances explained therein
Copy to the Dir of Sy &c.

Issued
29/7/42

64) The Dte file No. 184/C&O on the subject will now be returned to the Branch for further action. If apld a note will be added in the Dte file that the Govt Dir has been reminded to expedite his report

65) Kind Yesmen is invited to Govt's 16.8.41 & the decision of the Board in this behalf (Flags 'N' & 'O')
So far no reports have been received. Perhaps the Govt Dir may be requested to expedite action in this behalf
The subject placed before the Board after obtaining a definite & detailed report from him. The Dte file is also linked for Yesmen
for orders

66) Yes
U.S.(W)
4/8/42

67) Yes
Issue No. 77/42-43 dt 8/8/42
Dte file returned to the Branch on 8.8.42
JK
8/8

68) Put up with a Draft letter
JK
5/8

69) Issued
for
6/8/42

NOTE—Cont. Sheet.

WD 04155—GPB—55,000—23-10-41

Manufacture of Solamin
Permanganate

BOARD OF INDUSTRIAL PLANNING AND COORDINATION.

File No. of 194 . | General and Revenue Secretariat

Serial No.

To The Gast. Dir. I.C
Reminder to expedite the
investigating re: Pot. Permanganate.
Issue No. D.P. 79/42-3/8.8.42

Dh 2
8/8/42

Letter No. D. 1839/7.9.42 —
from the Dep. Ctl. Reminder to
expedite the forwarding of the report —

7) The letter is for perusal.
The Gast Dir was reminded on 8.8.42
to expedite his report in the matter,
& this is awaited. A Do Reminder
will be sent, if appd, & copy of this will be sent to Dep. Ctl. for info
with Ref to No. D 1839/7.9.42

8) Fr orders.

Dh 3
9.9.42

9) Fr
9.9.42

10) D & P Do Reminder to Gast Dir
Putup for Signature.

Dh 3
24/9/42

11) Issue
for
9.9.42

12. To The Gast Dir & Copy
No reply has been received to Dep. Ctl.
Issued No. DP 153, 154/24.9.42
If appd a Do Reminder will be issued.
D & P putup. Issue No. D.P 358/42-3 8.12.42
& No. DP 359/42-3. 8.12.42

Dh 3
8/12/42

Manufacture of Potassium Permanganate 116,324

78) No reply has been received from the Govt Dri. I.C, in spite of ordinary & do reminders from us

Sh 16/2/43

79) Wrote D/Hy again

16/2/43

80) D/F 7 subsequent;

Sh 17/2

17.2.43

To. The Govt Dri. I.C
do Reminder. D.O. 546/42.3
Dated 17.2.43

Letter No. fl 1279, 23.2.43 from the Govt Dri. I.C.

81) A.D.I. now reported that the work of Manufacture of Dichromate factory has been instructed to take up the work & submit Progress reports monthly. The next 82). Further report may therefore be awaited

Sh 5/3/43

83) 8/3/43

Letter No. fl 126/30.7.43 from the Govt Dri. I.C, furnishing an interim report

84) It is reported that further work cannot be taken up with the existing type of furnaces & that a Spl furnace has to be constructed. This work is stated to be in progress at the Govt Dri. The various instructions issued from time to time & the investigations [illegible]

PLANNING AND COORDINATION.

Manufacture of Potassium Permanganate

D.P. 324, 17.

immediately

19/8/42 (The I.G. file 184/40 also linked) Please bring up on 20/8/42 (Potassium Permanganate, visits abroad) 29/8/42

Precis of the foregoing Notes.

86) The manufacture of Potassium Permanganate is one of the important subjects engaging the attention of the Board from the Commencement. This investigation had been referred to the Dept. of Geology. As proposed by the Dir of Geo, a Spl. Research Scholar Dr. V. L. S. Chandrakanta was appointed to carry out the investigations in the Dept. of Geology in G.O. Dated 7-11-1939. The detailed investigations conducted by this Research Scholar, with reference to the local minerals are contained in the Report Placed in the I.G. file No. 184/40 (linked). A Spl. Committee with the personnel noted below was constituted as directed by Govt and this was treated as a Sub Committee of the Board. This Committee was asked to Scrutinise the Report & to submit Specific recommendations in this behalf. This Sub Committee

1) The Govt. Dir. I.C
2) The Dir. S.O.T.
3) Dr. K. R. Krishnaswamy, Indian Institute of Sc.
4) The Dir of Geo (Convener)

on 30-1-41 Resolved that in view of the limited demand for Potassium Permanganate in India, at present, it is not advisable to take up the Scheme & independently suggested that the scheme

may be forwarded to the Dichromate ~~Factory~~ ~~that~~ whenever opportunity occurs the manufacture may be taken up at the factory as an extension of work ~~has~~ was considered the ~~establishment~~ called in ~~some~~ respect. ~~when~~ the Waldie Committee ~~the~~ Govt Dri. I.C was not present. The report of the decision of the Committee were referred to the Govt Dri. I.C for his remarks He reported that the investigations were not conclusive & the report was untrustworthy & unacceptable & promised to pursue the investigation at the Dichromate factory. Thus on a reminder the Govt Dri I.C was asked to continue the investigations at the Dichromate factory & to submit a final report (vide Go. of 10/8/41) & the matter is pending with him since then.

Flag V.
If not filed
Mark:
para 10.V11 of the Note of the file No. 184/40 dated

W.

P.W.D.

87) The Govt Dri. has been reminded from time to time to expedite action in this behalf. He has now reported (on 30-7-43) that it is not possible to take up the work with the existing type of furnaces that a separate furnace has to be Constru

Manufacture of Potamine Permanganate

D.P. 324, 17

Continuation Sheet. D.P. File No. 47 of 40 Page.
BOARD OF INDUSTRIAL Current No.
PLANNING AND COORDINATION.

and it is reported that the work is in Progress ~~but the investigations~~ the Works Manager has been instructed to start with the investigations immediately. The file No. 1824/40 should be kept pending receipt of the further report which will be awaited

Dk 30/8

Minister DIS Dep Sec

3-9-43

91

11/9

11/9

~~Secretary~~

~~Minister~~

~~Dep Sec~~

~~Director~~

~~Chief Inspector~~

.N.Rao, D.Sc.,F.I.C., Govt. Ind & Testing Laboratory
Mallaswaram.
cal Assistant to the
vernment Director,
Industrial Concerns.
UNITED INDIA BUILDINGS.
SRI NARASIMHARAJA ROAD.
Bangalore City. Dated 24th Jan 4

Dear Mr. Shamanna,

I notice from the Proceedings of the meeting of the Industrial Research Board Sub-committee held on the 15th March 1941, the manufacture of Potassium permanganate and of Caustic soda was considered. May I request you kindly to send me the proceedings ~~copy~~ of the respective sub-committees and any reports, especially that of Mr. L.S. Chandrakanta for Permanganate?

Thanking you,

Yours sincerely,

K. Venkata Rao

T.Shamanna, Esq., M.A.,
Secretary, Board of Industrial
Planning and Co-ordination,
Public Offices, Bangalore.

A: P.S

Manufacturing of Caustic Soda at Pot. Permanyanate

9.P. Subject for perusal.
The Subject re: supply of Caustic Soda was considered by the Board in the year 1941, in view of the Conditions that existed then, it was decided that the Subject might be deleted from the list, as other ui S. 9 had already taken up this supply. The D.P. Correction 8/42:3 is herewith putting. The other subject referred to by Dr. Rao - Pot. Permanyanate - is in the final report of the Z.D. is still awaited the Report of Dr. Chandrakanta is treated as Confidential. If appd, both the files will be sent to the Tech Secy of the Board, U.O. for perusal and very early return, with his remarks if any. For order

Tech Secy 100 10/2/44
WCA 101
Kim 22/2
For perusal

30/1/44.

manufacture of Potassium permanganate

Continuation Sheet. File No. / Current No. 47/us of D.P. 1677, Page. 84

107 D & T reminder sent

Illegible 9/9

10[illegible] D.P. 383/43 us dt 23/5/44.
D/T reminder sent.
Illegible 9/9 : DP 107 d. 9.9.44.

Letter No. 1164/42 D2 dt 9/9/44 us from the Dir. Exp. Explosives stating that arrangements are in hand to fabricate a special Cast iron furnace It is stated that the exps conducted so far did not give useful results. A special Cast iron furnace has been proposed to the fabricated again M.P. Sec. Further report will be awaited. Srkd for perusal.

Illegible 3/10 in Dewsbury. 4/10 us

107 Illegible 4/11

D.P. 462 dated 1.12.44

Illegible 11/11

Letter No. 2113 dt 11.12.44 us from the Dir. Exp. Explosives Secy enclosing a copy of report from Works Manager Dicharwadi Factory to the Secy Explosives

108 The Report from the Works Manager Dicharwadi Factory is for perusal.

Manufacture of Potassium permanganate

C. F. 69]

Continuation Sheet. D.P. File No. / Current No. 47 of 110. Page. D.P. 84, 106

10/ Mr. Chandrakanta has conducted detailed investigations on Pot. permanganate & his work was entrusted to the Dicarnate factory by the Govt. Dei to verify the results reported by Mr. Chandrakanta. A definite programme is perhaps necessary. The Works Manager has asked the Govt to provide from the funds of B.S.&R. a sum of Rs 6,200/-. This request is not supported by the Dei of Engg. The factory has to perhaps meet the expr. if any, req. for the investigation. The remarks of the Govt Ley may be obtained. Submn for orders.

Dy. 110. The views of the Dir I & C Industries 16/12 may be obtained, Dr Rao being connected by him.

Dec Secy 16/12/44

111 Yes 28/1

(Dr 184/110 (1-4) in the Plan Life)

Dy. No. 110/44-5 dated 30-1-45 29/1

Forwarded Dy to the Dei of Engg. Chemical Industries for any remarks

Bo. Planning

For Secy.

Dy 29/1/45

Manufacture of Potassium permanganate

Continuation Sheet. DP File No. 47/ceo / Current No. of DP. 106 Page. 4849

Returned with Compts.

113 The Works Manager's application for a grant of Rs 6,200/- from the funds of the B.S.I.R. has been made at my instance and is fully supported by me. This is an experimental work and the expenditure can not be borne by the Rev. funds of the Bichromate Factory. The appln for the grant may be sanctioned

Develop Secy with Compts

31-7-45

Mr. Iswaran Secy & Exc. I

DIRECTOR ENGINEERING CHEMICALS LTD. MANGALORE No 2984 31-1-45

To be included in the agenda

114. This subject is proposed for the next meeting of the B.S.I.R to be held [illegible] the merits of the views of the Board may perhaps be taken before sanctioning the proposals. Submit for orders. —

115 To Mr Iswaran

Dy 3/2

Dev Secy 16 yes Secy

Mr Iswaran 1/2

117 (Subject included in the agenda for the meeting on 12/3/45)

Memo No. 2964/CB-2-45 from Mr I & Exc. I. forwarding a report on the progress of work done.

118 (Report perused by the B.S.I.R on 12/3/45.)

119 This subject was discussed at the meeting of the B.S.I.R. held on the 12th March 1945. The proposals of the Director of Eng.& Chemi.Ind. asking for a grant of Rs.6,200/- for the continuance of the investigations were also examined by by the Board. The general opinion of the Board was that in view of the limited demand for this product and as the major portion of the investigation had already been completed successfully (vide report of Mr.Chandrakanta) it is not worthwhile to proceed further with this work at this stage. The resolution of the Board on this subject is as under:

"IT WAS DECIDED THAT THE SCHEME MIGHT BE DEFERRED FOR THE PRESENT".

A printed copy of the proceedings of the meeting will be placed in this file immediately it is received from the Press.

In this connection reference is invited to G.O. of 16.8.41 wherein it has been ordered that some more investigations should be carried out and definite results obtained. To enable this work being carried out the Director of E & C.I. wants the grant of Rs.6,200 as noted above. In the circumstances, it is for orders, whether the further investigations referred to the Govt.Dichromate Factory should be continued or dropped for the present.

Rs 16/4/45 The resolution of the Board passed at their meeting held on 12.3.45 ('A') may be accepted.

Dwsecy

Chem. Secy)

OFFICE OF THE MINISTER FOR PUBLIC WORKS 7 MAY 1945 No. 8383

Dft letter under

Rs 16/5/45 Dwsecy 7.5.45 Ce 8/5/45

Ce 4/5/45 Rs 16/4/45

WD 02139—GPB—20,000—26-7

Manufacture of Potassium Permanganate

C. F. 69]

Continuation Sheet. I.P. File No. / Current No. 47 of 40 Page. 4849

I.P 321 D/ 28.5.45

To The Director, Engl + Ch. Industries

States that the scheme may be deferred for the present as recommended by the Board.

Confidential.

BOARD OF INDUSTRIES AND COMMERCE.

Proceedings of the Meeting of the Industrial Research Bureau Sub-Committee of the Board of Industries and Commerce held in the Chambers of the First Member at 1 p.m. on Tuesday the 7th November 1939.

Chairman.

Rajamantrapravina N. Madhava Rau, B.A., B.L.,
First Member of Council.

PRESENT.

1. Dr. J. C. Ghosh, D.SC., F.N.I.,
   Director, Indian Institute of Science, Bangalore.
2. Mr. M. S. Ramchendra Rao, B.A.,
   Director of Industries and Commerce in Mysore.
3. Mr. M. Venkatanaranappa, B.A.,
   Chairman, Mysore Iron & Steel Works, Bhadravati.
4. Mr. M. A. Srinivasan, B.A.,
   Government Director of Industrial Concerns.
5. Mr. S. G. Forbes, E.E., B.SC., (E. & M.E.) MEM. A.I.E.E.,
   Chief Electrical Engineer in Mysore.
6. Mr. T. G. Rama Iyer, B.A.,
   Director of Agriculture in Mysore.
7. Mr. B. Rama Rao, M.A., D.I.C.,
   Director of Geology in Mysore.
8. Mr. B. K. Murthy, B.E. (Mech.), M.SC. (Techl.), A.M.C.T.,
   Principal, Sri Krishnarajendra Silver Jubilee Technological Institute, Bangalore.
9. Mr. A. Venkata Rao Telang, M.A., F.INST.P.,
   Professor of Physics, Central College, Bangalore.
10. Dr. B. Sanjeeva Rao, M.A., PH.D. (Lond.),
    Professor of Chemistry, Central College, Bangalore.
11. Mr. E. K. Ramaswami, B.SC., A.C.G.I., M.A.S.M.E., M.I.E. (India),
    Principal, College of Engineering, Bangalore.
12. Dr. M. N. Ramaswamy, M.SC., D.SC. (Munich),
    Forest Chemist.
    (Represented Chief Conservator of Forests in Mysore, absent on deputation).
13. Mr. P. H. Krishna Rao, M.A.,
    Secretary to Government, Development Department.
14. Mr. V. Venkatachar, M.A., B.COM.,
    Assistant Director of Industries and Commerce (*Secretary*).

ABSENT.

1. Mr. S. G. Sastry, B.A., M.SC. (Lond.), F.C.S.,
   Director, Sandalwood Oil Factory, Mysore.
2. Mr. C. Abdul Jabbar, B.A.,
   Chief Conservator of Forests in Mysore.

(Letters expressing their inability to attend the meeting were received from them).

Formation of a Central Industrial Research Board in Bangalore.

The Chairman referred to the decision adopted by the Board of Industries and Commerce at its meeting held on 15th July 1939 in favour of bringing into existence a Central Industrial Research Board in Bangalore both to co-ordinate research work carried on in the several Government Departments as well as to suggest new problems of industrial importance and guide research work on such lines as to prevent over-lapping, and observed that the questions relating to the personnel of the proposed Board and the programme of work should be considered at this meeting.

The Chairman requested Dr. J. C. Ghosh, Director, Indian Institute of Science, to give an idea regarding the constitution and working of the Bengal Industrial Research Board.

Dr. J. C. Ghosh explained that the Bengal Industrial Research Board was constituted of Technical Officers of Government, Professors of Science of University, Representatives of Chambers of Commerce and Technical Experts. The Board sent out enquiries to important industrial and commercial concerns, Chambers of Commerce, etc., to elicit information regarding problems of industrial importance and a Sub-Committee of the Board selected from out of the subjects suggested only such as were of immediate industrial importance. The subjects so selected were referred to Sub-Committees consisting of technical experts or University for detailed investigation and report and the funds required by them were placed at their disposal out of the funds granted to the Board by Government.

Dr. B. Sanjeeva Rao referred to the Committee of Scientific and Industrial Research in London and said that this Committee was conducting research work of scientific and industrial importance through its several Sub-Committees appointed for the purpose and was making the results of research work available to all those interested in them.

Mr. S. G. Forbes, explained that in U.S.A. there is a Central Research Institution which is undertaking research work of all kinds referred to it by industrial concerns, commercial and scientific bodies, etc., and making the results available to them. The institution was meeting the expenses involved out of the funds placed at its disposal by those entrusting it with research work.

Continuing, he said, that in view of the rapid industrial development of the country, a Central Research Board should be brought into being immediately and might be affiliated with such institutions in Britain and America to facilitate mutual exchange of information.

Mr. M. Venkatanaranappa suggested that in view of the diversity of the problems to be considered by the Board, investigations and research work on the several subjects must necessarily be carried on by a number of Sub-Committees consisting of technical men actually engaged in the particular line of research.

All the members were agreed that there was immediate need for a Central Research Board in Bangalore with a view to furthering scientific and industrial research of practical importance.

The Committee adopted the following Resolutions :—

This Committee recommends that, in view of the rapid industrial development that has taken place in Mysore and the need to undertake research on problems of industrial and commercial importance and value both to Government and aided industrial concerns working in the State, Government be moved to constitute at an early date a Central Industrial Research Board in Bangalore consisting of some of the heads of all Government Technical Departments, the Director of the Indian Institute of Science, Scientists engaged in research work, Representatives of Industrial Concerns in the State including the Kolar Gold Mining Companies.

This Committee recommends that the proposed Industrial Research Board should be independent of the Board of Industries and Commerce and should have a small Executive Body to attend to routine work;

that the functions of the Board will be to co-ordinate research work that is now being carried on in several technical departments of Government, to suggest problems of immediate or ultimate industrial importance for investigation and to guide research work on such lines as to prevent over-lapping, waste of time and money;

that such research work be carried on by Sub-Committees appointed for the purpose and in such places where facilities are available; and

(xxiv) Manufacture of Sodium-Bi-Chromate.

There is a good demand for this chemical also by the tanning and other industries in the State. A separate Sub-Committee of the Board of Industries and Commerce has been appointed to go into this question. Their report may be awaited.

The Sub-Committee resolved that these recommendations may be communicated to the Board of Industries and Commerce and to Government for consideration.

V. VENKATACHAR,
Secretary.

N. MADHAVA RAU,
Chairman.

WD 2977—GPB—200—12-12-39.

that the Board may meet once a quarter to review the work of the Sub-Committees and to consider other matters with a view to furthering the scheme of research work.

The question of the programme of work was then taken up for consideration.

In this connection, the Director of Industries and Commerce observed that he had collected information from all the Government and Government aided industrial concerns as to their requirements of raw materials and semi-processed goods which they were importing and the imports of which had been rendered both difficult and costly owing to the outbreak of hostilities in Europe. A list of such materials required by them had been circulated to members for information.

Proceeding, the Director said, that at the moment the possibilities of locally manufacturing such materials as were now being imported by the industrial concerns in Mysore for purposes of manufacture, as furnished in the list, might be taken up for investigation in the order of importance. This suggestion met with general approval.

The Committee examined in detail the various raw materials and semi-finished goods that the industrial concerns were importing and constituted the following Sub-Committees to examine and report the possibilities of manufacturing them locally.

(i) Manufacture of Super-phosphates.

This constituted an important manure which was at present being imported. The question of preparing this chemical from bone meal is at present engaging the attention of Mr. S. G. Sastry, Director, Sandalwood Oil Factory, and Dr. Krishnaswamy of the Indian Institute of Science. The following Sub-Committee was constituted to examine the possibilities of manufacturing it locally :—

1. Dr. J. C. Ghosh, D.Sc., F.N.I.,
   Director, Indian Institute of Science (*Convener*).
2. Mr. S. G. Sastry, B.A., M.Sc., F.C.S.,
   Director, Sandalwood Oil Factory, Mysore.
3. Dr. K. R. Krishnaswamy, B.A., D.Sc., (Lond.), F.I.C.,
   Indian Institute of Science.

Dr. Ghosh to be the co-ordinating member and convenor.

(ii) Manufacture of Hydraulic Lime.

This is required for paper and other industries. This is, at present, being imported from Belgium and some quantity from Dhronachalam and Rampur. There are good lime stone deposits near Voblapur and other places in the State. The Director of Geology has already carried out some investigations, the results of which are reported to be encouraging. The further investigation of the question was referred to the following Sub-Committee :—

1. Mr. B. Rama Rao, M.A., D.I.C.,
   Director of Geology (*Convenor*).
2. Dr. H. S. Sharma, Ph.D. (Lond.), D.I.C. (Lond.)
   Chemist, The Mysore Paper Mills, Bhadravati.
3. Mr. Balakrishna, B.A.,
   Mysore Iron and Steel Works, Bhadravati.
4. Mr. G. Gundu Rao, M.Sc., A.I.I.Sc.
   The Mysore Sugar Co., Ltd., Mandya.

(iii) Manufacture of Ferro Manganese, Ferro Silicon, etc.

These are, at present, being imported from abroad by the Mysore Iron and Steel Works. Mr. Venkatanaranappa said that Mr. D. V. Krishna Rao was conducting experiments in regard to its manufacture at the works.

It was decided that the experiment be continued at the Iron and Steel Works and that Dr. B. K. Ramprasad, Government Electrical Department, be associated with Mr. D. V. Krishna Rao.

(iv) Magnesite Bricks.

These are at present being imported from Messrs. Burns & Co.'s Potteries at Ranigunj.

Mr. Rama Rao said that he had conducted some experiments but that they were discontinued owing to lack of suitable raw material for the purpose.

A suggestion was made that the brick plant in the Mysore Iron and Steel Works may be made use of for making these bricks.

The Chairman of the Mysore Iron and Steel Works was requested to send a Note on the subject for the consideration of the Board.

(v) Grinding Bodies for the Cement Plant.

These are also used in the Porcelain Factory. They are now being imported.

The Chairman, Mysore Iron and Steel Works, was requested to send a Note with samples to the Director of Geology for investigation and report.

(vi) Manufacture of Caustic Soda.

This is required by the Mysore Paper Mills, and by several other industries, such as Soap Factories, etc.

It was pointed out that the marketing of chlorine obtained as bye-product in the manufacture of caustic soda presented a problem. Further, the Okha Works and the Mettur Chemicals who are likely to start work in the near future might be able to supply the demand for caustic soda in Mysore. The question as to the quantity required by industrial concerns in Mysore, the outlets for the disposal of chlorine obtained as bye-product and the chances and scope for the industry, may all be investigated by the following Sub-Committee:—

1. Mr. M. A. Srinivasan, B.A.,
   Government Director of Industrial Concerns (*Convenor.*)
2. Mr. S. G. Sastry, B.A., M.Sc., F.C.S.,
   Director, Sandalwood Oil Factory.
3. Dr. B. K. Ramprasad, M.A. (Hon.), D.Sc., M.I.E. (Ind.)
   Government Electrical Department.
4. Dr. K. R. Krishnaswamy, B.A., D.Sc. (Lond.), F.I.C.,
   Indian Institute of Science.

(vii) Manufacture of Glauber Salt.

This is obtained as a bye-product in the manufacture of Sodium Bi-chromate. A scheme for the manufacture of the latter was under consideration by a Sub-Committee of the Board of Industries and Commerce. It was therefore decided that this question might be pursued by that Sub-Committee, and that the question of manufacturing Glauber Salt locally in view of there being a large demand for it may be investigated by (1) Dr. Krishnaswamy and (2) Dr. B. K. Ramprasad.

(viii) Manufacture of Alum.

Alum is required by the Paper Mills Co., by the Water Supply Department, etc. A large quantity of it is at present being imported.

The Director of Geology said that he had been conducting experiments with raw materials available in Mysore. Kemmangundi deposits are found useful. The further investigation of the question was entrusted to the following Sub-Committee:—

1. Mr. B. Rama Rao, M.A., D.I.C.,
   Director of Geology (*Convenor*).
2. The Director of Public Health.
3. Mr. S. G. Sastry, B.A., M.Sc., F.C.S.
   Director, Sandalwood Oil Factory, Mysore.
4. Dr. B. K. Ramprasad, M.A. (Hon.), D.Sc., M.I.E., (Ind.)
5. Mr. N. K. Seshadry Iyengar, B.A., M.Sc.,
   The Mysore Paper Mills, Ltd., Bhadravati.

(ix) Manufacture of Carbon Electrodes.

The Chairman, Mysore Iron and Steel Works, said that some experiments were being conducted in the Works with magnesite, making use of a Press obtained from the Government Electric Factory. The results were not encouraging. The passage of electricity was not good, which reacted on output.

Dr. Ghosh observed that Graphite Electrodes were very costly.

It was recognised that this was a serious problem and should be tackled immediately by the following Sub-Committee:—

1. Dr. B. K. Ramprasad, M.A. (Hon.), D.Sc., M.I.E., (Ind.), (*Convenor.*)
2. Mr. D. V. Krishna Rao, B.A., of the Mysore Iron and Steel Works,
3. One Chemist from the Mysore Paper Mills, and
4. One from the Indian Institute of Science.

(x) Manufacture of Soaps required by the Textile Mills.

The Government Director of Industrial Concerns explained that he had obtained samples of Marseilles soap from the Mysore Spun Silk Mills, Ltd., Channapatna, and had arranged to supply similar soaps to them, and he was also arranging to supply them to Sri Krishnarajendra Mills, Ltd., Mysore, and the Bangalore Woollen, Silk and Cotton Mills, Ltd.

(xi) Manufacture of Plastics.

Experiments in regard to manufacture of plastics were being carried on in the Indian Institute of Science by Mr. Srinivasaiya, by the Mysore Iron and Steel Works and by the Government Electric Factory.

The Chairman, Mysore Iron and Steel Works, said that they have ordered for machinery to try the manufacture of plastics on a semi-commercial scale. The following Sub-Committee was entrusted with the further investigation of the problem:—

1. Mr. V. Paul, Indian Institute of Science.
2. Mr. Ahmedali, Chemist, do
3. Mr. M. Srinivasaiya, B.A., F.I.I.Sc., of the Indian Institute of Science.
4. Mr. V. Rama Rao, B.Sc., of the Government Electric Factory.

(xii) Manufacture of Copper Wire, Galvanised Pins, etc.

The drawing of copper wire has been undertaken by the Government Electric Factory. The question of manufacturing galvanised steel pins and shackle for insulators may be investigated by the Government Director of Industrial Concerns with the co-operation of the Industrial Engineer and a representative of the Mysore Iron and Steel Works.

(xiii) Manufacture of Tube Glass.

The Director of Industries and Commerce said that the Mysore Glass and Enamel Works proposed to undertake the experimental manufacture of tube glass.

The Committee decided that the Director, Indian Institute of Science, may persuade one of the students in the Institute also to undertake this work.

(xiv) Manufacture of Chemicals, Drugs and Essential Oils.

The following Sub-Committee was constituted to go into the question:—

1. *Sastravaidyapravina*
   Dr. S. Subba Rao, B.A., M.B.C.M., L.R.C.P. (Lond.), M.R.C.S. (Eng.), D.P.H., Retired Senior Surgeon (*Convenor*).
2. Dr. B. T. Narayan, B.A., Ph.D., D.Sc.,
   Bio-Chemist, Department of Agriculture.
3. Mr. B. H. Krishna, M.Sc., A.I.C., A.I.I.Sc.,
   Industrial and Testing Laboratory.
4. Dr. B. L. Manjunath, B.A., M.Sc., D. PHIL.,
   Professor of Organic Chemistry, Central College.
5. Dr. P. C. Guha, D.Sc., (Cal.) of the Indian Institute of Science.
6. Dr. L. S. Doraswami, M.Sc., (Lond.) Ph.D., (Lond.),
   Superintendent of Government Gardens.
7. Mr. M. S. Krishna Rao,
   Superintendent, Government Soap Factory.
8. Dr. M. N. Ramaswami, M.Sc., D.Sc.,
   Forest Chemist, Forest Research Laboratory.
9. Mr. B. Sanjeeva Rao, B.A., M.Sc., (Mad.), F.I.I.Sc., of the Indian Institute of Science.

(xv) Manufacture of Cement Asbestos.

The Director of Geology said that some experiments had been conducted and as cement and asbestos were both available in Mysore, it was worthwhile taking up the investigation of this question.

The following Sub-Committee was constituted to examine this subject:—

1. Director of Geology in Mysore (*Convenor*).
2. Mr. S. G. Sastry, B.A., M.Sc., F.C.S.,
   Director, Sandalwood Oil Factory.
3. Mr. M. K. Narasimhan, B.A.,
   Cement Factory, Bhadravati.

(xvi) Manufacture of Potassium Permanganate.

The Director of Geology said that he had sent up proposals to Government for undertaking experimental work. It is proposed to prepare this by making use of ore available locally by electrolytic process.

The Committee decided that a scholar of the Indian Institute of Science may also be associated with the above work proposed to be carried out by the Director of Geology.

(xvii) Manufacture of Corundum Wheels, Sand Paper, etc., Abrasive Materials.

Dr. J. C. Ghosh said that some experiments had been conducted in the Institute in this respect.

The Director of Geology had also done some experiments and one Mr. P. Satyanarayana, Consulting Industrial Geologist, Malleswaram, Bangalore, has also done some work on it.

The Director of Geology was requested to get into touch with Dr. J. C. Ghosh and also to associate Mr. Satyanarayana with the work.

(xviii) Production of Cinchona.

Research work on cinchona taken up by Dr. M. N. Ramaswamy of the Forest Department may be continued and he be requested to send periodically progress reports to the Board.

(xix) Manufacture of Water-proof Fabrics.

This had been considered by the Board of Industries and Commerce. The note promised by the Director of Sandalwood Oil Factory may be obtained and the question pursued.

(xx) Mixture of Petrol and Power Alcohol.

Different percentages of petrol and ethyl alcohol which would give the best results as engine fuel should be tried in the Engineering College. If facilities are available motor car running tests may also be conducted. This must be done in a continuous manner.

The work may be carried out by the Principal, ngineering College, and a Chemist from the Mysore Sugar Company to be associated with him.

(xxi) Testing of Textile Samples.

There were ample facilities for the testing of cotton samples in the Indian Central Cotton Committee's Laboratories at Matunga.

In regard to testing of wool samples, etc., the Live-Stock Expert of the Department of Agriculture may be associated with the Principal of the Sri Krishnarajendra Silver Jubilee Technological Institute.

(xxii) Sulphur.

The Committee considered that as this was an important material required by most of the industries, its preparation from ores available locally should be investigated.

The Director of Geology said that he had been conducting experiments but as good ore had not yet been discovered, it had not been possible to arrive at any workable data.

The Committee considered it desirable to continue the investigation though this was of a long-range character and the Director of Geology agreed to do so.

(xxiii) Manufacture of Copper Sulphate.

There was a good demand for copper sulphate both by the Agricultural Department and the Forest Department. Mr. M. A. Srinivasan mentioned that the Mysore Chemical Manufactures, Limited would be manufacturing this article shortly.

Immediate
No. 5559

B5. 9 Dr.

B'lore
4 5/3/40.

Dear Sir,

With refce. to your letter no
A/800 dt 9.1.940, I shall be
highly obliged if you will kindly
arrange to
send me the Notes on the

1. Manufacture of Tube Glass.
2. Manufacture of Potassium Permanganate.

marginally noted subjects at an early date, as they are required for being placed before the next meeting of the Board of Dr. which has been fixed to be held on the 16th inst.

N
6/3/40.

Thanking You,

Yours Sincerely,

A. 3
5/3/40

Dr. J.C. Ghosh, Esq D.Sc., F.N.I.
Director, Indian Institute of Science,
B'lore

INDIAN INSTITUTE OF SCIENCE.

BANGALORE, INDIA.

J. C. GHOSH. D. Sc., F.N.I.,
DIRECTOR.

D/ 800

TELEGRAMS:
"SCIENCE", BANGALORE.
CODE: A.B.C. 5TH EDITION.

9th January 1940.

The Secretary,

Board of Industries and Commerce,

Bangalore.

Subject:- 1. Manufacture of Tube Glass.
2. Manufacture of Potassium Permanganate.

Dear Sir,

With reference to your letter No.350-55 dated the 8th January 1940, I write to inform you that the matter is receiving my attention.

Yours faithfully,

J C Ghosh

Director.

Ite BI office
Mar
10/1/40

M. B. RamaRao, M.A., D.I.C., F.G.S.,
Director of Geology.

Mysore Geological Department.

Bangalore, 13th Jany 1940.

D.O. No. 9652-11 9611-129

Dear Sir,

Referring to your D.O. letter No.350-55 dated 8th January 1940, requesting me to forward the notes on the marginally noted subjects, I desire to state that a Research Scholar has since been appointed in this Department for conducting investigations on a semi-commercial scale to ascertain if Potassium permanganate could be manufactured profitably in the State. He has been carrying on experiments in this connection at the Government Industrial and Testing Laboratoty applying thermal methods. No work has yet been done applying electro-chemical methods as arrangements are being made to secure the necessary Electrical apparatus. As his appointment has been made only recently with effect from 20th November 1939, not much progress has been made as yet and it will take sometime before the results of the investigations could be intimated.

Subjects
1. Manufacture of Potassium permanganate.
2. Sulphur.

As regards sulphur, investigations will be conducted during the current field season by the application of Geophysical Survey methods.

Yours sincerely,
BRamaRao

To

V.Venkatachar, Esq., M.A., B.Com.
Secretary,
Board of Industries & Commerce,
BANGALORE.

INDIAN INSTITUTE OF SCIENCE.

BANGALORE, INDIA.

J. C. GHOSH, D. Sc., F.N.I.,
DIRECTOR.

D/832

TELEGRAMS:
"SCIENCE", BANGALORE.
CODE: A.B.C. 5TH EDITION.

23rd January 1940.

The Secretary,

Board of Industries & Commerce,

Bangalore.

Subject:- Manufacture of Potassium Permanganate.

Dear Sir,

Kindly refer to your letter No.350-55 dated the 8th January 1940. Mr.N.S.Saigal, the research student in the Department of Chemistry, who is working on the problem of the manufacture of potassium permanganate is now on leave. As soon as he comes back I shall write to you again on this matter.

Yours faithfully,

J.C.Ghosh

Director.

Board office

Mem forwarded

the Dir of Ind. & Com.

by the minister of Indus.

29.1.40

Rly with Encl
31.1.40 No. 4006/

Board of Sc.

Enclosure

B'lore,
29.1.40.

Dear Sir,

I am directed to send enclosed a copy of letter no. D. 832 of 23.1.40 recd. from the Director, Indian Institute of Science, B'lore, re' manufacture of Potassium Permanganate.

I shall write to you again on hearing from the Director of the Institute re' the return of Mr. N. S. Saigal.

Yours faithfully,

29.1.40

29.1.40.

B. Rama Rao, Esq., M.A., D.Sc.,
Director of Geology in Inspection,
B'lore

Immediate
No. 572

B.S. & Ltr.

B'lore,
dt 5/3/40.

~~Dear Mr Ghosh~~

Dear Sir,

I write to invite a kind reference to yr. letter no. D/8 32 dt 23.1.940, intimating to me that Mr. N. S. Saigal, the Research Student in the Dept. of Chemistry, who is working on the problem of the manufacture of potassium permanganate is on leave, etc., and to request you to be so good as to kindly let me know, his return of yours, if Mr. Saigal has since returned from leave. If so, I shall be highly obliged if you kindly arrange to put him in touch with the Director of Geology in Mysore, who has been experimenting on the manufacture of potassium permanganate.

I request the favour of your early compliance in the matter.

Yrs. Sincerely,

Dr. J. C. Ghosh, D.Sc., F.N.I.
Director, Indian Institute of Science, B'lore

No. 573

Copy of the above is forwarded with Compts. to the Director of Geology in Mysore in continuation of this office letter no. 406 dt 31.1.40.

Dir. - Secy.

Mr. B. RAMA RAO, M.A., D.I.C., F.G.S.,
Director of Geology.

MYSORE GEOLOGICAL DEPARTMENT,

D. O. No. 9652-14
Encl: One.

Bangalore, 15th March 1940.

Dear Sir,

Referring to your D.O. letter No.567-71 dated 6th March 1940 requesting me to forward the notes on the marginally noted subjects, I desire to invite reference to my D.O. letter No.9652-11 dated 13th January 1940 with which a reply was furnished in the matter. However, a copy of the note submitted by Mr. L.S. Chandrakant on the investigations so far conducted by him on the manufacture of potassium permanganate is herein enclosed for information.

Subjects:-
1. Manufacture of Potassium permanganate.
2. Sulphur.

Yours sincerely,
B Rama Rao

V. Venkatachar, Esq., M.A., B.Com.,
Secretary,
Board of Industries & Commerce,
BANGALORE.

COPY OF NOTE BY MR. L.S. CHANDRAKANT, RESEARCH SCHOLAR, ON THE INVESTIGATIONS FOR THE MANUFACTURE OF POTASSIUM PERMANGANATE.

From theoretical considerations it has been found that, of the three raw materials potassium hydroxide, potassiur carbonate and potassium nitrate, although the latter two are cheaper than KOH in Mysore, there is not much to gain in employing them as sources of potassium for permanganate manufacture in preference to KOH, in view of the fact that (a) in the thermal production of $KMnO_4$, the equations show, 197 parts of K_2MnO_4 are produced from 56 parts of KOH or from 99 parts of K_2Co_3 and the greater cost of KOH than K_2Co_3 is counterbalanced by its lower consumption, (b) the employment of K_2Co_3 causes some unavoidable difficulty in the succeeding electrolytic conversion of K_2MnO_4 to $KMnO_4$, which indeed should be taken into serious consideration, (c) there is no thermal combination between KnO_3 and MnO_2, (d) in the process of fusing KnO_3 with a suspension of MnO_2 and electrolysing it in the molten condition, the cost of fusing KnO_3 and electrolysing it for 5-6 hours in that state counterbalances the cheapness of KNO_3, in addition to the fact that the KNO_2 formed during the process, even in small quantities, gives rise to the same trouble as K_2CO_3 in the succeeding electrolytic oxidation of K_2MnO_4, besides lowering the yield of $KMnO_4$. This process can be worked successfully only where KnO_3 is available very cheap.

Hence the employment of KOH offers many advantages over the rest. From the experiments conducted it has been found that the process for a large scale production of $KMnO_4$ should consist of (i) Roasting KOH with MnO_2 in a current of air under pressure for about 2 hours at 500°C, the proportion of the reaction mixture being 2.6 molecules of KOH/molecule of MnO_2. (ii) Dissolving the K_2MnO_4 formed in water and electrolysing it in aqueous state when $KMnO_4$ is produced, part of $KMnO_4$ crystallising out.

P.T.O.

The percentage content of MnO_2 in the Mysore ore tried was 68, out of which more than 70% was converted into $KMnO_4$. Cent per cent conversion was not possible to obtain because of the impurities like Fe, Si etc., contained in the ore which hindered complete conversion. The conditions arrived at are all from a series of experimental trials and are almost optimum. Most favourable conditions of working in the electrolytic oxidation of K_2MnO_4 to $KMnO_4$ have also been found out. The anolyte consisting of 40 gms. of K_2MnO_4 and 140 gms. of KOH/litre, the anodic current density being 0.0083 - 0.0208 amp./cm.^{2} for gauze nickel anodes 100% current efficiency is obtained with 80% conversion of K_2MnO_4 to $KmnO_4$ or 86.6% current efficiency with 100% oxidation, in both cases the electrolyte being stirred.

For the reproducibility of these results on a large scale, semi-large scale working of the process is under trial. The roasting will be done in large mild steel vessels, in a coal-heated furnace, under pressure with very frequent stirring of the mass during roasting. Before the actual roasting a preliminary operation is carried out, which it is hoped will increase the percentage conversion of MnO_2 to $KMnO_4$. It consists of mixing MnO_2 with KOH dissolved in the least quantity of water, powdering the mass, heating it for about one hour at 250°-300°, when a considerable part of the total absorption of oxygen takes place. The mixture is then charged in mild steel vessels and heated to 450°-500°C when the absorption of oxygen is completed. During roasting moistening the mass and reheating enhances the yield to a very appreciable extent.

B Rama Rao

D I R E C T O R ,
MYSORE GEOLOGICAL DEPARTMENT.

Ar.15/3

No. 747

5th May 1940.

V.Venkatachar Esq.,M.A.,B.Com.
XXXXXXXXXXXXXXXXXXXXXXX

Dear Sir,

I write to invite a kind reference to your letter No. D.832 dated 23-1-'40 and my reminder on 5-3-'40 regarding Mr.N.S.Saigal, Research Student in the Department of Chemistry. I request you to be so good as to kindly intimate immediately if Mr.Saigal has since returned from leave. If so, I shall be much obliged if you will kindly arrange to put him into touch with the Director of Geology in Mysore, Bangalore, who has been conducting experiments on Potassium Permanganate.

The favour of an early compliance is requested.

Thanking you,

Yours sincerely,

Sd/- V.Venkatachar.

Dr.J.C.Ghosh D.Sc.,F.N.I.,
Director, Indian Institute of Science,
Hebbal P.O., Bangalore.

P.T.O.

SGR-3)

No.748

Copy of the above is forwarded with compliments to the Director of Geology in Mysore, Bangalore, in continuation of this office letter No.573 dated 6-3-'40.

SECRETARY.

CENTRAL INDUSTRIAL RESEARCH BOARD.

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16. Manufacture of Potassium Permanganate:-

Investigations are being carried on by the Research Scholar of the Geological Department and the Director, Indian Institute of Science, has been requested to associate an expert with the above work and to put a research student of the Institute into touch with the Director of Geology.

CENTRAL INDUSTRIAL RESEARCH BOARD.

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16. Manufacture of Potassium Permanganate:-

Investigations are being carried on by the Research Scholar of the Geological Department and the Director, Indian Institute of Science, has been requested to associate an expert with the above work and to put a research student of the Institute into touch with the Director of Geology.

3. Mr. B. H. Krishna, M.Sc., A.I.C., Industrial and Testing Laboratory.
4. Dr. B. L. Manjunath, B.A., D.Phil., M.Sc., Professor of Organic Chemistry, Central College, Bangalore.
5. Dr. P. C. Guha, D.Sc. (Cal.), the Indian Institute of Science.
6. Dr. L. S. Doraswami, M.Sc. (Lond.), Ph.D., Economic Botanist.
7. Mr. M. S. Krishna Rao, Superintendent, Government Soap Factory.
8. Dr. M. N. Ramaswamy, M.Sc., D.Sc., Forest Research Chemist, Forest Research Laboratory.
9. Mr. B. Sanjeeva Rao, B.A., M.Sc. (Mad.), F.I.I.Sc., the Indian Institute of Science.

The Government Director, Industrial Concerns, pointed out that due to War, the cost of essential oils had gone up considerably and the imports had fallen off considerably. It was unanimously agreed that for such of the essential oils for the distillation of which raw materials are locally available, immediate steps should be taken to manufacture them after ascertaining the demand and commercial possibilities. The Board was of opinion that the cultivation of important herbs should be pursued. The Chairman pointed out that the cultivation of cinchona was being extended in the Kadur District. The Director, Sandalwood Oil Factory, suggested that geranium might be grown in the premises of the Sandalwood Oil Factory, as the sample oil distilled from the geranium grown experimentally in the Soap Factory compound was very good and better than the imported material and that the plants could be easily grown and there was a potential market in India for the oil at remunerative prices.

The Chairman finally observed that immediate attempts should be made to encourage private persons to grow geranium and the question of distillation taken up by the Sandalwood Oil Factory.

(15) *Manufacture of Cement Asbestos.*—

Present Personnel.

1. The Director of Geology in Mysore (*Convenor*).
2. Mr. S. G. Sastry, B.A., M.Sc. (Lond.), Director of Sandalwood Oil Factory
3. Mr. M. K. Narasimhan, B.A., Cement Factory, Bhadravati.

After reviewing the work done, the Chairman observed that this question might be dropped.

The question of disposing of the stock of asbestos in the Sandalwood Oil Factory, Mysore, was brought up by the Director of Sandalwood Oil Factory.

The Director of Industries and Commerce said that the existing stock (in the Sandalwood Oil Factory, and with the Director of Geology) might be converted into boiler composition—a simple industry—and at a later stage handed over to private enterprise. The Director, Sandal Oil Factory, said that about 50 tons were available in Mysore. The Director of Industries and Commerce promised to furnish very early the local demand for boiler composition.

(16) *Manufacture of Potassium Permanganate.*—The Director of Geology said that the work was in progress and that final report from the chemist on this special work was awaited.

(17) *Manufacture of Abrasive materials such as Corundum Wheels, Sand Paper, etc.*—It was decided to delete this subject.

(18) *Production of Cinchona.*—It was resolved that the report from Dr. M. N. Ramaswamy be placed before the Committee.

(19) *Manufacture of Water-proof fabrics.*—The Chairman observed that this subject might be left to the Textile mills.

(20) *Mixture of Petrol and Power Alcohol.*—This subject was also decided to be deleted.

(21) *Testing of Textile Samples.*—This subject was also decided to be deleted.

(22) *Sulphur.*—The Director of Geology was requested to expedite the work in connection with the location of sulphur in the State.

(23) *Manufacture of Copper-sulphate.*—Since the Mysore Chemical Manufactures, Ltd., have already been manufacturing this chemical in their works at Turbanahalli, it was resolved to delete this subject.

(24) *Manufacture of Sodium-bichromate.*—The Chairman wanted to know the progress with regard to the construction of buildings and the erection of plant.

The Government Director, Industrial Concerns, and Dr. Krishnaswamy explained the position and said that the work was progressing expeditiously.

II. The next subject considered was Dr. A. V. Varadaraja Iyengar's proposition with regard to the utilization of molasses for the production of potassium salts.

The scheme of Dr. Varadaraja Iyengar was examined. Dr. Krishnaswamy suggested that the question of Tartaric-acid manufacture could conveniently be taken up later, after investigating the availability of green tamarind and that in the meantime, the recovery of potash salts from molasses might be taken up immediately. The Director of Sandalwood Oil Factory read out the discussion he had with Sir M. O. Forster regarding the advisability of taking up this scheme Dr. Krishnaswamy further suggested that a sub-committee might be appointed to go into this subject and advise the Board.

The Chairman desired to know the working costs involved with full details.

It was finally decided to request Dr. Varadaraja Iyengar to furnish details with regard to cost, etc., to handle ten tons of molasses as an experimental measure, in the proposed Pilot plant, to be placed before the Committee at its next meeting.

III. The starting of a Glue Factory was the last proposition discussed. After a preliminary discussion, the Director of Industries and Commerce was requested to complete the necessary inquiries and get complete statistical information for being placed before the House at its next meeting.

It was the opinion of the House that this was a proposition in which the Mysore Tanneries, Ltd., should interest themselves.

The Chairman thanked the members and the meeting terminated.

K. PARTHASARATHI,
Secretary.

N. MADHAVA RAU,
Chairman.

WD 786—GPB—100—21-11-40

CONFIDENTIAL.

INDUSTRIAL RESEARCH BOARD.

Proceedings of the First Meeting of the newly constituted Industrial Research Board Sub-Committee held on Tuesday the 3rd September 1940, at 1 P.M. at the Chambers of the First Member of Council.

PRESENT.

Rajamantrapravina N. Madhava Rau, Esq., B.A., B.L.,
First Member of Council (*Chairman*).

Members.

1. Mr. M. Venkataṇaranappa, B.A.,
Chairman, Mysore Iron and Steel Works, etc.,
Bhadravati.
2. Mr. B. G. Appadorai Mudaliar, B.A., B.Sc., A.M.I., M.E.,
Director of Industries and Commerce in Mysore,
Bangalore.
3. Mr. K. Parthasarathi, B.A.,
Ag. Director, Sandalwood Oil Factory,
Mysore.
4. Mr. E. V. Ganapathi Iyer, B.Sc.,
Government Director, Industrial Concerns,
Bangalore.

Mr. K. Parthasarathi, B.A.,
Ag. Director, Sandalwood Oil Factory,
Mysore (*Secretary*).

Mr. C. E. Noronha, M.A., Secretary to Government, Development Department, Dr. K. R. Krishnaswami, B.A., D.Sc. (Lond.), F.I.C., Indian Institute of Science, and Mr. B. Rama Rao, M.A., D.I.C., Director of Geology, were also present by request.

GENERAL.

Opening the proceedings of the regular meeting, the Chairman referred to the agenda circulated to the members and said that the review of work done by the several sub-committees constituted by the Research Bureau Sub-Committee on 7th November 1939 may be taken up for consideration.

(1) *Manufacture of Super-phosphates.*—The progress of work done by this Committee was read out.

Present Personnel.

1. Dr. J. C. Ghosh, D.Sc., F.N.I.,
Director, Indian Institute of Science (*Convenor*).
2. Mr. S. G. Sastry, B.A., M.Sc. (Lond.), F.C.S.,
Director, Sandalwood Oil Factory.
3. Dr. K. R. Krishnaswamy, B.A., D.Sc. (Lond.), F.I.C.,
Indian Institute of Science.
4. Mr. E. V. Ganapathi Iyer, B.Sc.,
Government Director, Industrial Concerns (new member from 4th September 1940).

Dr. Krishnaswamy explained the details of the experiments conducted by him in respect of phosphatic nodules of Trichinopoly. The suggestion of the Committee to depute an officer of the Geological Department was also considered. The Chairman observed whether it was necessary to depute an officer, when other raw materials are locally available for the manufacture of super-phosphates.

Mr. E. V. Ganapathi Iyer stated that Messrs. Parry & Co., Madras, are manufacturing super-phosphates out of bones collected from various parts of South India and making large profits. He said that some experiments are being conducted in the Mysore Chemicals and Fertilisers, Ltd., Belagula, and he would be suggesting independently to Government to start a fertiliser industry. The Chairman remarked that the very idea of starting the Mysore Chemicals and Fertilisers, Limited, was to develop a fertiliser industry in the State and there was no necessity to have a separate factory to manufacture fertilisers. Dr. Krishnaswamy explained to the house that the manufacture of super-phosphates from bones is a simple proposition and could be advantageously pursued.

The Chairman desired to know if statistical information with regard to the availability of bones in the State could be had from the Market Survey reports of the Department of Industries and Commerce. The Director of Industries and Commerce stated that plenty of bones were available in the State, particularly in the Malnad area, and promised to furnish complete information to the Board at its next meeting.

It was resolved that the sub-committee should investigate the position as regards raw materials, the availability of market, equipment necessary with working costs, etc.

The Chairman suggested that Mr. E. V. Ganapathi Iyer, Government Director, Industrial Concerns, may also serve as a member on this sub-committee.

(2) *Manufacture of Hydrated Lime.*—

Present Personnel.

1. Mr. B. Rama Rao, M.A., D.I.C.,
   Director of Geology (*Convenor*).
2. Dr. H. S. Sharma, PH.D. (Lond.), D.I.C. (Lond.),
   Chemist, The Mysore Paper Mills, Ltd.,
   Bhadravati.
3. Mr. Balakrishna, B.A.,
   Mysore Iron and Steel Works,
   Bhadravati.
4. Mr. G. Gundu Rao, M.Sc., A.I.I.Sc.,
   The Mysore Sugar Co., Ltd., Mandya.

The Chairman remarked that further experiments should be continued at Bhadravati and also at the Porcelain Factory, and this subject may be omitted from the list.

(3) *Manufacture of Ferro-Manganese, Ferro-Silicon, etc.*—The Chairman, Mysore Iron and Steel Works, explained that the scheme for the installation of 1·500 K. V. A., electric furnace for the manufacture of Ferro-alloys had since been sanctioned by Government and that further work was in progress. Since this question had reached a stage when no further advice was necessary, the Chairman observed that further consideration of this subject might be dropped.

(4) *Magnesite Bricks.*—The Chairman, Mysore Iron and Steel Works, stated that the Indian raw material was stated to be unsuitable for the manufacture of magnesite bricks and that the Works, at present, imported these bricks from Japan, and they were giving satisfactory results. Dr. Krishnaswamy stated that as the Indian material being far too pure, the results may not be satisfactory and suggested that further expriments might be conducted at the Porcelain Factory, when the tunnel kiln was ready.

(5) *Grinding Bodies for the Cement Plant.*—The Chairman, Mysore Iron and Steel Works, explained in detail the experiments conducted at the Works.

The Committee opined that it would not be possible to manufacture these at economical rates.

It was resolved to delete this subject.

(6) *Manufacture of Caustic Soda.*—

Present Personnel.

1. Mr. E. V. Ganapathi Iyer, B.Sc.,
   Government Director, Industrial Concerns (*Convenor*).
2. Mr. S. G. Sastry, B.A., M.Sc., (Lond),
   Director, Sandalwood Oil Factory.
3. Mr. B. K. Ramprasad, M.A. (Hon.), D.Sc., M.I.E. (Ind.),
   Government Electrical Department.
4. Dr. K. R. Krishnaswamy, B.A., D.Sc. (Lond.), F.I.C.,
   Indian Institute of Science.
5. Mr. B. Rama Rao, M.A., D.I.C.,
   Director of Geology (new member from 4th September 1940).

The Government Director, Industrial Concerns, pointed out that the Sub-Committe had already sent its recommendation to manufacture this chemical.

The Director of Sandalwood Oil Factory read out the recommendation referred to by the Government Director, Industrial Concerns. The Government Director, Industrial Concerns, explained the implications involved and stated that as there were no manufacturers in South India and as there was a ready market, the chemicals could be readily sold.

There was a general discussion about the Lime-stone deposits in which the Director of Geology and Dr. Krishnaswamy actively participated. It was pointed out that the demand for soda-ash and also chlorine obtained as a bye-product in the manufacture of Caustic-soda and the possibilities of utilising chlorine in the manufacture of super-bleach and bleaching powder should be examined.

It was resolved that the Sub-Committee be requested to carefully re-examine the visible market for the chemicals and other bye-products, plant and equipment required, with capital and running costs involved, etc., and to favour the Board with a comprehensive report.

The Chairman said that Mr. B. Rama Rao, Director of Geology, might also serve on this Committee.

(7) *Manufature of Glauber Salt.*—The quantity of Glauber Salt available as a bye-product in the manufacture of Sodium-bichromate being very small, it was decided that the question might be dropped from further consideration. It was, however, considered that the manufacture of Sodium Sulphite should be kept in view in connection with the scheme for the manufacture of Acetic-acid.

(8) *Manufacture of Alum.*—

Present Personnel.

1. Mr. B. Rama Rao, M.A., D.I.C.,
   Director of Geology (*Convenor*).
2. The Director of Public Health.
3. Mr. S. G. Sastry, B.A. M.Sc. (Lond.),
   Director of Sandalwood Oil Factory.
4. Dr. B. K. Ramprasad, M.A. (Hons.), D.Sc., M.I.E. (Ind.),
   Government Electrical Department.
5. Mr. N. K. Seshadri Iyengar, B.A. M.Sc.,
   The Mysore Paper Mills, Ltd.

In view of the fact that the Mysore Chemical Manufactures, Ltd., had interested themselves in the manufacture of alum, and as,. so far as the Board were

aware, no special problems were involved, it was decided that this subject might be deleted from the list.

(9) *Manufacture of Carbon Electrodes.*—

1. Dr. B. K. Ramprasad, M.A. (Hons.), D.Sc., M.I.E. (Ind.) (*Convenor*).
2. Mr. D. V. Krishna Rao, B.A.,
   Mysore Iron and Steel Works.
3. One Chemist from the Mysore Paper Mills, Ltd., and
4. One from the Indian Institute of Science.

The progress of work done by this Committee was noted with satisfaction. Dr. Krishnaswamy said that at the Indian Institute of Science, experiments were being conducted at the instance of Government of India. The Chairman, Mysore Iron and Steel Works, pointed out that the experiments were being continued in the Iron Works as well.

It was resolved to request the Sub-Committee to get the results of experiments and to go into further details and to furnish a report to the Board as early as possible.

(10) *Manufacture of Soaps required by the Textile Mills.*—The Government Director, Industrial Concerns, explained that textile soap of good quality was being manufactured and supplied by the Government Soap Factory. It was decided to delete this subject.

(11) *Manufacture of Plastics.*—

Present Personnel.

1. Mr. V. Paul,
   Indian Institute of Science.
2. Mr. Ahmedali,
   Chemist, Indian Institute of Science.
3. Mr. M. Srinivasaiya, B.A., F.I.I.Sc.,
   Indian Institute of Science.
4. Mr. V. Rama Rao, B.Sc.,
   Government Electric Factory.

After reviewing the work of the Committee, the Chairman pointed out that the Government of India was also interested in this proposition. The Chairman, Iron and Steel Works, suggested that as the Pilot Plant is being erected at Bhadravati, he could try to manufacture formaldehyde there.

The Chairman showed to the Members two sets of samples of Bakelite product—one set made out of local powder prepared at Bhadravati, and the other with imported powder. The samples from the local powder were found to be as good as those from the imported one.

Dr. Krishnaswamy said that Dr. J. C. Ghosh, Director, Indian Institute of Science, had full information about Bakelite powder and plastics in general.

It was decided that the Sub-Committee should be requested to pursue the investigation further and also to consider the commercial aspect of the proposition.

(12) *Manufacture of Copper-wire, Galvanised Pins, etc.*—Since regular work had commenced at the Electric Factory, it was decided to delete the subject.

(13) *Manufacture of Tube Glass.*—The Chairman observed that this subject might be deleted as it was receiving the attention of Messrs. The Mysore Glass and Enamel Works, who anticipated no serious technical difficulties.

(14) *Manufacture of Chemicals, Drugs and Essential Oils.*—

Present Personnel.

1. *Sastravaidyapravina* Dr. S. Subba Rao, B.A., M.B.C.M., L.R.C.P. (Lond.), M.R.C.S. (Eng.), D.P.H., Retired Senior Surgeon. (*Convenor.*)
2. Dr. B. T. Narayan, B.A., Ph.D., D.Sc., Bio-Chemist, Department of Agriculture.

Industrial Research Board.

& Secretary,
Industrial Research Board.

10th December 40

Do 132/40-1

Dear Mr.Rama Rau,

Subject: Manufacture of Potassium Permanganate.

In inviting a kind reference to your D.O. letter No.9652-14 dated 15th March 1940 to the Secretary, Board of Industries and Commerce forwarding a note submitted by Mr.Chandrakanta on the above subject, I request you to be so good as to forward a note regarding the further progress and the possibilities of taking up the manufacture of this chemical on a commercial scale.

I may also be informed if Mr.Saigal, Research Student in the department of Chemistry, Indian Institute of Science, is associating himself with Mr.Chandrakanta.

An early reply is requested.

Yours sincerely,

B.Rama Rau,Esq.,M.A.,D.I.C.,F.G.S.,
Director of Geology in Mysore,
Bangalore.

Mr. B. RAMA RAO, M.A., D.I.C., F.G.S.,
Director of Geology.

F. 47-40-1

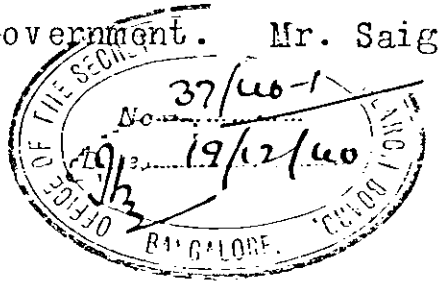
MYSORE GEOLOGICAL DEPARTMENT,

D. O. No. 9652-36

Bangalore, 17th December 1940.

Dear Mr. Parthasarathi,

In reply to your D.O. letter No.132/40-1 dated 10th December 1940 requesting to send a note regarding the further progress and the possibilities of taking up the manufacture of Potassium Permanganate on a commercial scale, I desire to state that the final note submitted by Mr. L.S. Chandrakant on the result of his investigations and his scheme for taking up production of Potassium Permanganate on a small scale at Belagula is being scrutinised by a special committee, as directed by Government. Mr. Saigal has not been in touch with me.



Yours sincerely,
B Ramarao

Submitted for kind perusal)

K.Parthasarathy, Esq., B.A.,
Secretary, Industrial Research Board
&
General Manager, Govt. Electric Factory,
Mysore Road, Bangalore City.

Acknowledge 19/12/40

Chairman) 19/12

Do 179/40-1

19th Decr. 0

Dear Mr. Rama Rau,

Subject: Potassium Permanganate.

I am in receipt of your D.O. letter No. 9652-36 of the 17th instant, on the above subject.

May I request you kindly to let me know the personnel of the Special Committee, appointed to scrutinise the note and scheme submitted by Mr. Chandrakanta.

I also request you kindly to let me know if at this stage, if it is necessary that Mr. Saigal should get into touch with you in connection with the above.

Yours sincerely,

B. Rama Rau, Esq., M.A., D.I.C., F.G.S.,
Director of Geology in Mysore,
Bangalore.

No 201/40-1

26th Decr. 0
29

The Director of Geology in Mysore,
Bagalore.

Subject: Potassium permanganate.

Further to my D.O. letter No.179/40-41 of the 19th instant, on the subject, I am desired to request you to forward a copy of the final note and scheme of Mr. Chandrakanta, and also to intimate the decisions of the special Committee, for consideration of the Board.

I have the honor to be;
Sir,
Your most obedient servant,

Secretary.

Mr. B. RAMA RAO, M.A., D.I.C., F.G.S.,
Director of Geology.

OFFICE OF THE SECRETARY INDUSTRIAL RESEARCH BOARD
No. 78/40
Date 6/1/41
Bangalore

MYSORE GEOLOGICAL DEPARTMENT.

D. O. No. 9652.46. Bangalore, 4th January 1941.

1) Ack
+ Submitted
a note to
Mr. Chandrakant

Dear Mr. Parthasarathi,

Your D.O. letter No.179/40-1 dated 19th December 1940 regarding the manufacture of Potassium Permanganate to hand.

6/1

The following is the personnel of the Special Committee appointed to scrutinise the scheme submitted by Mr. L.S. Chandrakant :-

(1) The Government Director of Industrial Concerns,
(2) The Director, Sandalwood Oil Factory, Mysore,
(3) Dr. K.R. Krishnaswamy of the Indian Institute of Science,
(4) The Director of Geology in Mysore.

Whether at this stage Mr. Saigal should get into touch with me in connection with the above, I do not consider it necessary now.

Subject 1) Ack Cob
2) note put up for above
Sh 7/1/41

Yours sincerely,
B Rama Rao

K. Parthasarathi, Esq., B.A.,
Secretary, Industrial Research Board
&
General Manager, Govt. Electric Factory,
Mysore Road, Bangalore.

316/001

15th Jany. 1

46

B. Rama Rau, Esq., M.A., D.I.C., F.G.S.,
Director of Geology in Mysore,
Bangalore.

Subject: Manufacture of Potassium Permanganate.

With reference to your letter No.9652-46 of the 4th instant, on the above subject, I directed to inform you that since there is no separate sub-committee under the Research Board to examine the above subject, the special Committee referred to in your letter under reference, is now treated as a Separate Sub-Committee of the Research Board. You will be a Member and Convenor of the Sub-Committee.

I am also desired to request you to keep the Board informed of the developments.

I have the Honor to be,
Sir,
Your most obedient servant,

Secretary.

47-40-2 WIT03798—GPB—50,000-14-6-40

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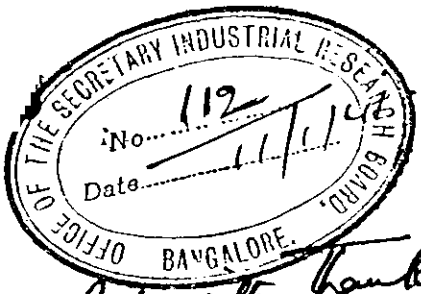

Ack'd (1) Ack with thanks
9/3 (2) For study & [illegible]
a note for subm.
to Chairman

11/1/41

14/1

From

The Director,
Mysore Geological Dept.,
Bangalore.

To

The Secretary,
Industrial Research Board,
Bangalore.

Dated 9th January 1941.

Despatched

Received

General No. 9652-48.
No.

Enclosure No.

Sir,

With reference to your letter No.201/40-1 dated 26/27th December 1940 regarding Potassium Permanganate, I have the honour to state that there is only one - original copy of the final note and scheme of Mr. L.S. Chandrakant, which, it is regretted, it is not possible to send. However, a copy of the extracts from the said note as circulated to the members of the Special Committee, is herein enclosed for your information.

The decisions of the Special Committee will be intimated in due course after a meeting of the Committee is held.

I have the honour to be,
Sir,
Your most obedient servant,

B Ramdas

D I R E C T O R,
Mysore Geological Department.

Ar.9/1

Extracts from the Report of Investigations conducted by Mr. L.S. Chandrakant, M.Sc., Research Scholar, on the manufacture of Potassium Permanganate from Mysore Pyrolusite.

P r o c i s.

The possibility of manufacturing potassium permanganate in Mysore from the pyrolusite occurring in the State has been completely investigated from an industrial standpoint and a scheme for the manufacture, based on the results of the investigations has been described. Considered from all points of view, of the several methods for the manufacture of potassium permanganate, the Thermo-Chemical method employing potassium hydroxide and manganese dioxide as basic materials for the manufacture, has been found the most suitable, the working details of which process, have been thoroughly investigated from semi-large scale experimental trials. Results have been obtained for the following operating conditions:-

(i) Composition of the reaction mixture, (ii) Temperature of roasting, (iii) Duration of chemical reaction, (iv) Substitution of cheap sources of oxygen necessary for the reaction in place of costly imported materials like potassium chlorate or nitrate, (v) The influence of moisture and other physico-chemical factors on the percentage yield of the final product. Under (iv) an important and useful suggestion has been made regarding the utilisation of the electrolytic oxygen produced at Belugula by the Mysore Chemicals and Fertilisers, as a by-product, but wasted by them at present.

The cost of production of potassium permanganate by the method recommended has been worked out and is shown to a first approximation, by utilising the State pyrolusite and potassium hydroxide (to be imported) and under the optimum conditions of the various operating physico-chemical factors, to be about Rs.1,350/- per ton, which shows a fair margin when compared with the imported material, thus warranting an economically successful manufacture.

It has been well brought out that although permanganate manufacture is possible in the State, all the limitations if any, for starting it as an entirely separate and independent Unit (about 2-3 lakhs rupees worth for the whole of India and ½ to 1 lakh for South India) will be absent, if it is made an important component of a group of allied chemical industries based on the State's mineral resources, like Potassium di-chromate, magnesium sulphate, manganous sulphate, metallic manganese and manganese di-oxide (pure) from low grade manganese ores etc.

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x x x x x x

Methods for large scale production of Potassium Permanganate.

(a) Thermo-Chemical

(b) Electro-Chemical.

Discussion of the above methods of permanganate manufacture from Mysore standpoint.

Having outlined the several methods available for permanganate manufacture, the next step is an examination of the suitability or otherwise of them for a large-scale production of the material in the State. In all the methods but one, namely, electrolysis of aqueous alkali, potassium manganate is first produced and this is latter on converted into permanganate, whereas in the exceptional case, permanganate is directly formed without the intermediate manganate.

The use of potassium carbonate in I is absolutely useless, as there is very little combination between K_2CO_3 and MnO_2. Hence the use of K_2CO_3 for $KMnO_4$ manufacture is better left out of consideration.

(Of these materials, potassium hydroxide and chlorate are imported into India almost in their entirety, the exceptional case, permanganate is directly formed without the intermediate manganate. However, the following classification shows the basic materials employed in permanganate manufacture.)

I. Thermo-Chemical :- Potassium hydroxide or Carbonate as the source of alkali, manganese dioxide and potassium chlorate or nitrate to supply oxygen, but only occasionally other cheap sources of oxygen can be substituted as well. ((Vide infra P.23 (d)). The use of potassium carbonate also is absolutely useless, as the combination between K_2CO_3 and MnO_2 is very little. Hence the basic materials in this method can be taken as mainly KOH and MnO_2.

II. Electro-Chemical :-

(a) Aqueous Electrolysis :- Potassium hydroxide or Carbonate and ferro-manganese electrodes.

(b) Fused Electrolysis :- Potassium nitrate, manganese dioxide and suitable iron electrodes.

Of these materials, potassium hydroxide and chlorate are imported into India almost in their entirety. Only manganese dioxide and potassium nitrate are available in India abundantly and in Mysore only the former, regarding which she occupies the third important place in India. There is, unfortunately, no mention-worthy source of potassium in the State and any chemical industry requiring potassium salts, has to depend entirely upon supplies from outside. Further, although Mysore is rich in Manganese deposits, production of ferro-manganese alloy has not yet been undertaken. This fact strengthened by the absence of any native source of alkali in the State, completely leaves out of consideration, method II (a), namely, electrolysis of aqueous potassium hydroxide or carbonate between ferro-manganese electrodes, for permanganate manufacture. Hence, are we left with only methods I and II (b) for selection? As has already been outlined previously, in both these two methods the source of manganese is manganese dioxide, only the source of potassium being different, which accounts

for all difference between them in their suitability from the Indian standpoint. India occupies almost an unique position in the world in respect of potassium nitrate and manganese dioxide, which are largely exported. Any method of permanganate manufacture, using these two as basic materials, does undoubtedly claim more suitability than the rest. Thus, electrolysing fused potassium nitrate with a suspension of manganese dioxide in it, to obtain potas ium manganate, depends entirely for its successful working economically, on the cheap availability of potassium nitrate and manganese dioxide and also cheap water power. These conditions are indeed fairly satisfied in certain parts of India. The thermo-chemical method, using potassium hydroxide as a basic material, can never adequately represent a process of permanganate manufacture based on cheap indigenous raw materials in view of the necessity of importing potassium hydroxide from outside.

But, the conditions presented in Mysore are entirely different, for although India is rich in respect of KNO_3 sources, it is not every part of India, e.g., Mysore, that is so. Hence, if it be for the moment assumed that permanganate manufacture in Mysore is possible, leaving a detailed investigation of this for further reference as has been done here, selection of the method to be employed must be effected, mainly by a comparative study of the methods I and II (b) in respect of their efficiencies, cost of working, their advantages and disadvantages, etc., entirely from the Mysore standpoint. As the first step towards this, are to be considered the prices of the basic materials employed, as they are available in Mysore, which are fairly approximately as follows for large scale purchase.

Potassium hydroxide per ton = Rs.640.
Potassium Nitrate per ton = Rs.440.

In view of only the cheapness of the material employed, namely potassium nitrate, the method of electrolysing fused nitrate with a suspension of MnO_2 (method II (b)) appears to be more advantageous than the thermo-chemical (method I) in which

the costly KOH is employed. But as against this are the following facts which completely alter the position, thus making the process in no way as suitable as the other: (a) although the cost of KnO_3 in Mysore is 7/10 of KOH, it is not so cheap as it is in the provinces of Bihar, U.P., Bengal, etc., where KnO_3 is only 1/3 of KOH in price; (b) the efficiencies of the two processes employing these materials widely differ, as also their costs depending to a great extent upon the basic materials employed. Thus taking only the main features of the two processes in a comparative manner, when they are working with pure materials,

Process.	Outline of the process.	Wt. of K_2MnO_4	Materials and their quantities used.
Thermo-Chemical.	Heating the reactants in an oxidising atmosphere at about 500°C for about 3-4 hours.	43 parts by weight.	KOH + MnO_2 28 parts + 22 parts
Electro-Chemical (Fused Electrolysis II (b).)	Fusing KnO_3 with a suspension of MnO_2 in it, maintaining the electrolyte at about 400°C and then electrolysing it for about four hours.	43 parts by weight.	KnO_3 + MnO_2 90 parts + 20 parts.

(The above figures are based on the author's experimental investigations and are approximate to the first degree).

From the above it is seen that in order to obtain 43 parts of K_2MnO_4, only 28 parts of KOH - 22 parts of MnO_2 are required in the thermo-chemical process, whereas in the electro-chemical, for the same quantity of K_2MnO_4, 90 parts of KNO_3 - 20 parts of MnO_2 are required. Added to this is that the electro-chemical is more elaborate and fairly more complicated than the thermo-chemical.

thus pulverising the latter thoroughly throughout the process. This continuous pulverisation considerably improves the yield, as was corroborated by the results. The preliminary heating was carried out in an electrically-heated oven instead of over a free flame as a convenience and to avoid too great a contamination with carbon dioxide. The heat was so regulated in this part of the process, that when the mixture was completely dry its temperature, remained in the neighbourhood of 300°C. At the end of roasting samples were removed from the rotary kiln, leached with water and their K_2MnO_4 content estimated by titration against standard oxalic acid.

(a) In the first series of experiments carried out to determine the best molecular proportion of the reactants so as to give the maximum percentage conversion of the total MnO_2 content of the ore into K_2MnO_4, varying amounts of KOH and MnO_2 were mixed as above, charged into the kiln and heated for 3½ hours. The temperature of the kiln was about 500°C and during roasting, preheated air was continuously passed over the mixture under pressure, and also the mixture was thoroughly moistened by steam several times at regular intervals and reheated. From the results of the experiments, returned in Table I (a), it has been found that, although according to the equation (xiv), two molecules of KOH are required for every molecule of MnO_2 to produce one molecule of K_2MnO_4, in actual practice when working with commercial samples, the quantity of KOH required for every molecule of MnO_2 is always greater and that too, 100% conversion of the total MnO_2 content of the ore into K_2MnO_4 does not happen. However, a maximum conversion of 80-85% is obtained when the ratio of $\frac{KOH}{MnO_2} = 3.0$ molecules, beyond which no further increase in the conversion is observed. This excess quantity of KOH and the conversion, always lower than the theoretical value, can only be accounted for the impurities in the commercial potash, as also in the pyrolusite ore, like iron, silica, etc.

(N.B. The reasons for the use of hot compressed air and moisture in the above experiments are given in Sections (b) and (c), P.23, 24).

A. Since, for permanganate formation, potassium manganate being the necessary material the first portion of the experimental study comprised of determining the various physico-chemical factors influencing the formation of manganate and the optimum conditions under which the maximum conversion of $MnO_2 \longrightarrow K_2MnO_4$ occurs. Working actually on a semi-large scale, the following factors were studied, regarding which the available literature give but very meagre information.

(a) Molecular proportion of the reactants.

(b) Temperature of roasting.

(c) Duration of roasting.

(d) Replacement of the costly imported potassium chlorate or nitrate as sources of oxygen, by cheaper materials like the atmospheric air.

(e) The influence of moisture on the percentage conversion of the ore into potassium manganate.

The materials used in all the experiments were commercial, potassium hydroxide of 85% pure and Mysore pyrolusite mined at Karakuchi, of 68% MnO_2 content. The procedure of the experiments consisted of mixing finely ground pyrolusite (about 200 meshes) with a concentrated solution of potassium hydroxide, drying the mixture in a current of air, such that when cool it can be well powdered and will no longer become soft on raising it to the higher temperatures to which it is next exposed and finally heating this powdered material in a current of air in an apparatus in which the mixture can be continually ground while being heated. The apparatus consisted of a rotating mild-steel drum fitted with iron ribs parallel with the axle and with openings for removing material for analysis. This drum was rotated in an iron housing and was heated by gas. The axle was hollow and broken in the middle of the drum. Through one end of the hollow axle preheated air was introduced and into the other end a thermo-couple was loosely fitted. The charge, prepared as above was placed in the drum and with it a fairly large number of 3/4" steel-balls. As the drum rotated slowly (20-30 r.p.m.) the balls were lifted by the ribs in the sides of the drum and dropped back on the material,

(b) In the second set of experiments, mixtures of KOH and MnO_2 were prepared in the best ratio of $\frac{KOH}{MnO_2}$ = 3.0 molecules as determined in (a) and were heated for 3½ hours in the rotary kiln at various ranges of temperature, while they were exposed thoroughly to the action of hot compressed air and at regular intervals, to steam again, as in (a). At the end of each operation the K_2MnO_4 formed at that temperature was leached with water and its K_2MnO_4 content was estimated by titration against standard oxalic acid. The results are returned in Table I (b) from which is evident the fact that the influence of temperature on the percentage conversion of $MnO_2 \longrightarrow K_2MnO_4$ is considerable. Above 600°C (which is the decomposition temperature of K_2MnO_4), the percentage conversion of the total MnO_2 content of the ore into K_2MnO_4 decreases for the same quantities of KOH and MnO_2; so also in the case below 300°C. But between 300°C and 500°C the conversion steadily increases till it becomes constant (about 85%) between 450°C - 600°C which is hence, the optimum temperature at which the maximum percentage conversion of $MnO_2 \longrightarrow K_2MnO_4$ occurs.

(c) The duration of roasting the reaction mixture is not without influence on the final yield of K_2MnO_4, which was next studied. Table I (c) gives the results of roasting the reaction mixture in the ratio of $\frac{KOH}{MnO_2}$ = 3.0 molecules at about 500°C for various periods and show that roasting for less than three hours in the kiln does not bring about the maximum percentage conversion. It also shows that heating beyond 3 hours does not materially increase the yield. However, when the roasting is carried out for 3-3½ hours, a maximum conversion of 85% is obtained.

(d) Replacement of the costly potassium chlorate or nitrate as a source of oxygen by cheaper materials is, indeed, one of the most important aspects of the subject. From an examination of Equation (xiv), it is readily seen that for complete formation of potassium manganate, oxygen is necessary, which in most industrial operations, is supplied by $KClO_3$ or KNO_3 provided they are cheap enough for the purpose. But in Mysore, neither of them is

appreciably cheap, $KClO_3$ being even costlier than KCl, and utilisation of them as sources of oxygen is practically beyond all consideration. On this account, the oxygen of the atmosphere, the only readily available cheap source, has been thought of as a suitable substitution and experiments were made passing hot compressed air over the reaction mixture. This worked quite satisfactorily as shown by the results returned in Table I (d). When the reaction was carried out in the absence of air, it resulted only in about 50% conversion of $MnO_2 \longrightarrow K_2MnO_4$. But the conversion figure reached 80% when pure dry air, preheated and under pressure was passed over the mixture while it was roasted and under the optimum conditions of (a), (b) and (c). Hence substitution of the oxygen of the atmosphere as a source of oxygen for large scale production of permanganate has been proposed. But far greater advantages with consequent increase in the percentage conversion are gained if a cheap source of pure oxygen itself is availed of for the purpose. A Possibility of this lies in making use of the electrolytic oxygen, produced by the Mysore Chemicals and Fertilisers at Belagula, which at present is let out into air as waste gas.

(e) The influence of moisture on the reaction is, indeed, interesting besides being of great significance from an industrial standpoint, results of Table I (e) showing to this effect. When the reaction was carried out without moistening the mixture even once during the 3 hours roasting, at the end of the operation, only about 50% conversion of the total MnO_2 content of the ore into K_2MnO_4 resulted; whereas, on passing steam through the rotary kiln, so as to thoroughly moisten the mixture and further reheating, a surprising increase in the % conversion was observed, depending to a considerable extent upon the number of times the mixture was moistened and reheated. Thus, on moistening only once during the 3 hours roasting and reheating the mixture, the conversion figure rose from 50% to 60%; on moistening twice and reheating, it came up to 71 and finally to 85%, when the mixture was moistened

4 or 5 times at regular intervals and reheated after each moistening operation.

Summarising the above results, it has been found that when the production of potassium manganate is carried out starting with commercial potassium hydroxide, 85% pure and Mysore pyrolusite of 68% MnO_2 content, conversion of 85% of the total MnO_2 content of the ore into K_2MnO_4 is obtained under the optimum conditions of (a), (b), (c), (d) and (e).

Hence, that the complete replacement of imported $KClO_3$ or KNO_3 by hot dry air under pressure to supply oxygen for the reaction, the necessity of moisture for a higher yield of the product as also the most favourable molecular ratio of the reactants, the optimum temperature and duration of heating the mixture as established from the above series of experiments, are all factors of great importance in any permanganate manufacturing process employing KOH and MnO_2 in the thermal method, hardly needs any further emphasis.

B. Conversion of Manganate into Permanganate.

The several processes for the conversion of $K_2MnO_4 \longrightarrow KMnO_4$ have already been described and also the advantages of the electrolytic process over the rest (vide P.9). Experimental trials of this process were made by electrolysing the K_2MnO_4 produced as in (A) between nickel gauze anodes and iron cathodes, with suitable arrangements for stirring the electrolyte during electrolysis and maintaining its temperature at 60°C. The electrolytic cell was of mild steel, steam-jacketed and diagram 1 shows the entire arrangement. The electrolyte consisted of 9% K_2MnO_4 and 5% KOH and current for electrolysis was supplied by a 6.5 K.W. Motor-generator. The bath voltage was about 4 volts and the anodic and cathodic current densities were respectively 9 and 90 amperes/dm^2. The current efficiency was about 80% and more than 60% of the K_2MnO_4 produced was oxidised. At the end of the electrolysis, much of the permanganate formed crystallised out

in the cell itself. The alkaline liquors were afterwards drawn off, concentrated and the remaining $KMnO_4$ recovered. The mother liquid was later used for lixiviating more melt. The total energy consumption, calculated from actual experimental data amounted to about 0.6-0.7 K.W.H. per 1000 gms. of $KMnO_4$ produced.

Technical Details of Permanganate Manufacture by the Chemical Method.

In view of the reproducibility of the results obtained in the preceding section, on a manufacturing scale, in this section a comprehensive study is made of all the technical operations to be necessarily carried out in the chemical production of potassium permanganate. Herein under are the several stages involved in the process.

(i) Crushing and grinding of the ore (pyrolusite) to about 200-250 meshes.

(ii) Fusing the finely powdered ore with a concentrated solution of potassium hydroxide (in the best molecular proportions given in section 5 (i) (a)), and drying the mixture in a current of air, and then when cool it can be well powdered.

(iii) Charging the mixture into the rotary kiln, heating between 450° - 500°C while hot compressed air or oxygen is continuously passed over it, for about 3-3½ hours and also during the roasting to moisten the mixture thoroughly with steam several times at regular intervals and reheating.

(iv) Leaching the roast with waste electrolytic liquors from (vi) & separation of unreacted and insoluble matter from the alkaline manganate solution.

(v) Electrolytic oxidation of manganate into permanganate under favourable conditions when most of the permanganate formed crystallises out.

(vi) Recovery of uncrystallised permanganate from the electrolyte and use of the waste liquors to leach more melt.

(vii) Drying and packing crystals of permanganate.

The above steps in the order shown may be considered here in detail. Regarding crushing and grinding of the ore, the operation can be carried out in the orthodox manner, there being no need for any special design of apparatus or uncommon equipment for the purpose. Since pyrolusite is not a very hard material (the order of hardness being < quartz) it can be crushed by human labour to 3/4" size, and by means of an edge-runner, this can be ground from 3/4" to 16 meshes. Further for fine grinding from 16 meshes to 200 meshes, ball-mills will do. For the second operation namely, mixing KOH and MnO_2 cast iron or mild steel vessels, suitably heated by electricity or gas can be employed. The vessels heated externally must be maintained at a temperature of 300°C, their contents being well stirred by power-driven stirrers or agitators. When the mass has become hard and dry, they must be removed from the containers, powdered in a ball mill and charged into the rotary kiln for final heating. The rotary kiln can be of the same design as described in Section 5 (A), constructed of mild steel or cast iron and heated in an iron housing, with suitable arrangements for passing hot air and steam, the dimensions of it, being 4 feet in length and a maximum diameter of 3 feet. It must be charged along with the mixture, with a convenient number of steel or pebble balls, so that when the kiln is rotated, due to the impact of the balls, the mixture can be ground well while heated. (The principle is the same as an ordinary ball-mill but with slight alterations). Here the question of heating arises. Oil-gas-heating is universally considered the most suitable for many purposes (of which the present case can be one), and in Mysore, although electrical-energy is supposed to be quite cheap, is not cheap enough (being about ¼ anna per K.W.H.) to be a keen competitor to the former. From detailed calculations made in this connection it is found that the total quantity of heat required for roasting the reaction materials to produce 1 ton of permanganate, amounts to about 17×10^5 B.t.u. which if

supplied by oil-gas of heat-capacity of about 150,000 B.t.u./ gallon and the same approximately at Rs.16 per 40 gallons, works out far cheaper than electrical-heating (3415 B.t.u./K.W.H.) at the existing rates, both these two sources working at 70% efficiency. Added to this is the fact that the equipment for gas-heating is highly improved, cheap and readily obtainable; whereas electrical-heating has a wide range of limitations and presents great difficulties regarding equipment etc., in every individual case. However, the employment of electrical-heating for the present purpose can be considered, in case there is a likelihood of obtaining the energy at cheaper rates than now and the equipment necessary is of simple design and construction.

In this part of the process, the adjustment and maintenance of constant temperature is important, for above 600°C the percentage conversion of $MnO_2 \longrightarrow K_2MnO_4$ steadily decreases. Hence the heat must be uniformly distributed over the entire sphere of the reaction and fairly constant during the whole process of about 3-3½ hours roasting. The number of revolutions per unit time of the roaster must be such as to allow the mass to be well powdered by the impact of the balls, thus facilitating the formation of K_2MnO_4. The air or oxygen that is to be passed over the mixture through conduits at the sides of the roaster must be fairly under pressure and preheated by passing them from blowers or compressors through a series of coils suitably placed inside the furnace itself, thereby not necessitating separate heating arrangements. At regular intervals for about 5 times, the current of air must be stopped and steam passed over the mixture till it becomes thoroughly moistened and the heating continued while the supply of air is resumed afterwards. When the reaction is complete, determined by drawing out samples from the roaster and analysing, the roast is discharged from the kiln, powdered again and leached with a spent electrolyte from the electrolytic cells, in enamelled, steam-jacketed vessels. Since K_2MnO_4 easily dissolves in hot water made alkaline, all the unreacted particles of the ore, soon settle down and the clear liquor after being used for continuous

multi-effect washing operation can be drawn off right into the electrolytic cells. In case very efficient leaching is found necessary a Dorr multi-deck classifier can be advantageously employed. Before the manganate solution passes into the electrolytic cells, final separation of fine particles of hydrated manganous di-oxide may also become necessary, in which case a frame and plate filter-press with asbestos fabric medium or even any common filter like centrifugal or vacuum with equipment for filtering alkaline manganate solutions which easily attack organic matter may be employed.

The design and construction of the electrolytic cell is complicated and requires much skill and care. In Section 5 (B) it has been seen that the electrolytic oxidation of manganate per manganate must be carried out at a temperature of about 60°C, for which purpose the electrolytic vessel must naturally be steam-jacketed. Figure II (A) shows a convenient form of a cell technically employed. It consists of a cylindrical iron vessel with a conical bottom from which the electrolyte can be drawn off and a wooden cover. A mechanical agitator reaches nearly to the bottom of the cell. The electrodes, sheet-nickel gauze anodes and iron-rod cathodes, are arranged in a ring concentrically, as shown in Fig.II (B), resting on glass pieces which are secured by cement on to the side of the cell. The areas of the electrodes are so chosen as to give anodic and cathodic current densities of about 0 and 90 Amps./dm^2, respectively. The bath containing 9% K_2MnO_4 and 6% KOH is worked at 60°C and takes about 3-4 volts. Each cell is of about 900-950 litres capacity and the number of cells depends upon the total quantity of K_2MnO_4 to be electrolysed. At the end of electrolysis most of the permanganate formed crystallises out in the cell itself and the rest in solution is recovered by drawing off the liquors and concentrating them till when cool, the permanganate separates out. The waste liquors contain all the excess alkali, the recovery of which is important, for from the results of Sec.5 (A), it is seen that in order to obtain nearly 85% conversion of MnO_2 K_2MnO_4, 3.0 molecules of KOH/molecule of

MnO_2 must be used, out of which only 1.7 molecules of KOH are used up for K_2MnO_4 formation the rest remaining in the leached liquor. Therefore the waste liquors after all the permanganate has been removed, are boiled down and the excess alkali is recovered and used again for subsequent reacting with the ore.

Crystals of permanganate are first centrifuged and then dried in vacuo.

Costing of the process.

In this section an approximate costing of the theoretical process of potassium permanganate as described in the preceding sections, is made giving thereby at a probable cost per ton of permanganate if produced in Mysore, using black Pyrolusite and potassium hydroxide imported from outside.

The first point to be considered here is the average consumption of permanganate in India, regarding which, there is absolutely no reliable figure available. However, from enquiries made in many markets, it has been learnt that the consumption of permanganate in India amounts to about 250 long tons annually (i.e., 130 tons) out of which 60/ per year can be accounted for the South Indian share. Hence, it is only fair to consider a plant capable of producing 1/4 ton of permanganate per day of 24 hours, working for 300 days a year.

The raw materials required on a basis of 80% conversion of the total MnO_2 content of the ore into K_2MnO_4 and 90% recovery of the latter as $KMnO_4$ are :

0.27 ton of the ore (Pyrolusite of 65% MnO_2 content)

and 0.4 ton of (85% pure) commercial potassium hydroxide.

Out of the total KOH used as above in the ratio $\frac{KOH}{MnO_2} = 3.0$ molecules, only 0.23 ton of the alkali is used, for permanganate formation, the 0.16 ton of this surplus alkali can be recovered and used up again for subsequent operations. Hence, actually, we have used 0.24 ton of KOH per 1/4 ton of $KMnO_4$ produced.

The cost of the materials, thus, is 0.27 ton of the ore at Rs.8/- per ton at the nearest railway station to the inco = Rs.2-0-0.

0.24 ton of the alkali at Rs.640/- per ton f.o.r. Bangalore Rs.156-0-0.

For the present, if the factory is supposed to be at Bolu-Gulu, the cost of transport of the materials to the factory site must be taken into account which will be Rs.8/- per ton of the ore and Rs.8/- per ton of the alkali.

Hence, the total cost of the materials at the factory site will be Rs.160-0-0.

Items.	Daily product cost including depreciation & interest on the investments.	Investment.
1. Raw materials, (F.O.R. factory)	Rs.160 0 0	Rs.
2. Crushing, pulverising and slime grinding.	Rs. 4 0 0	Rs. 1500 0 0
3. Slimy and preliminary heating.	Rs. 2 0 0	Rs. 2000 0 0
4. Roasting.	Rs. 10 0 0	Rs. 5000 0 0
5. Powdering and leaching.	Rs. 6 0 0	Rs. 2000 0 0
6. Settling and filtration.		
7. Electrolysis (at 1/2 amp./sq.in.).	Rs. 10 0 0	Rs. 8000 0 0
8. Concentration, crystallisation of $KHnO_4$ and recovery of KOH.	Rs. 10 0 0	Rs. 5000 0 0
9. Centrifuging and drying of $KHnO_4$ crystals.	Rs. 4 0 0	Rs. 2000 0 0
10. Lands & Buildings.	Rs. 13 0 0	Rs.24000 0 0
11. Boilers, &c.	Rs. 10 0 0	Rs. 5000 0 0
12. Supervision, office and incidental charges.	Rs. 20 0 0	Rs. 500 0 0
13. Packing and transport to Madras.	Rs. 10 0 0	

So, for quarter ton of permanganate to be put on market at Madras, the cost of production is Rs.264-0-0 and the fixed capital is Rs.50,000/-. To this should be added Rs.20,000/- as floating capital (expenses for 100 working days). So the capital investment is Rs.70,000/- and our maximum cost of production reaches Rs.270 per quarter ton, whereas the same material is priced at a little more than Rs.320/- per quarter ton, at Madras. This shows a very fair margin, indeed, to warrant a minimum net profit of Rs.50 per day or Rs.15,000/- per year, taking 300 working days in the year, which is about 20% net profit on the total investment.

(All the above calculations are based on the pre-war rates of materials).

Having thus been that the manufacture of potassium permanganate from Mysore Pyrolusite can be profitably exploited in the State, the last and perhaps the most important point that requires elucidation is not how it can be done. At present there is hardly a single permanganate producing unit in India, in spite of the fact that, surprising as it is, India is unique in the whole world in respect of her vast mineral wealth, particularly manganese. Such being the case, the exact nature and conditions of Indian permanganate industry is well-nigh impossible to surmise. Further, the actual consumption of the material in India is rather hard to estimate, due to unavailability of figures, although in this report about 2-3 lakhs rupees worth of the material has been taken to represent fairly the average trade. Moreover, the use of permanganate for various industrial purposes (which are not few) does not appear to have been extended. Hence, that not a little care and vision is necessary for starting permanganate production as a separate and entirely independent Unit by itself, needs no further emphasis. But all these limitations do not present such unfavourable conditions, if the whole subject is viewed in an altogether different aspect, namely, A Group of Allied Chemical Industries. The manufacture of permanganate is entirely a chemical industry based on mineral resources, and there are many more, very similar to it in all important respects, like

manganese and pure manganese dioxide from various manganese ores, Sodium or potassium dichromate from chromite ores, pure alumina and aluminium sulphate from bauxite, magnesia and magnesium sulphate from magnesium minerals, etc., to name a few. All these industries, including permanganate have very much in common between them. More than 60% of the equipment necessary for the manufacture and technique of the processes are the same. They are closely allied and some of them have reached very promising stages of establishment. Thus for the growing Indian steel and electrical industry (accumulators, batteries, etc.) pure manganese and manganese dioxide are very largely in demand; the present day demand for dichromate is beyond doubt. So also are, pure alumina for Indian aluminium industry and aluminium-sulphate and magnesium sulphate as valuable chemicals of every day importance. Mysore in the whole of India, occupies indeed a very prominent and advantageous position in respect of all the mineral resources and cheap electrical power, necessary for the manufacture of the above materials. Hence if two or three of the several items, or as many as possible, are made components of a single large unit, they lend a sort of support to one another. Thus, if permanganate, manganese, manganese dioxide and dichromate are combined into one Unit, the set-backs in one, if any, will be made good for, by the favourable working of the rest. Moreover, the cost of establishment, supervision and process and consequently the cost of production of the final product, of each of them when considered as components of a single Unit, will be appreciably smaller than what they would be if they are independent units, each by itself. In short, all the great advantages of allying several inter-related industries, which have been very well realised and established in recent times by actual experience, will be available. Hence, the matter before us, namely, successful production of permanganate is best exploited, in this new light of a group of allied industries based on mineral resources after a more detailed and comparative study.

B Rama Rao

Director,
Mysore Geological Department

I.W. 47-44-3

GOVERNMENT OF MYSORE.

Telegraphic Address :—"GEOL."

In all communications please quote our reference No. 9652-59/Econ: one.

MYSORE GEOLOGICAL DEPARTMENT

Bangalore, 1st. Feb. 1941.

FROM

B. RAMA RAO, ESQ., M.A., D.I.C., F.G.S.,

Director of Geology in Mysore,

Bangalore.

TO

K. Parthasarathi, Esq., B.A.,
Secretary,
Industrial Research Board,
Bangalore.

Submitted with a note for the

3/2/41

SIR,

I have the honour to forward herewith a copy of the proceedings of the meeting of the Committee for Potassium Permanganate, held at the office of the Director, Mysore Chemicals and Fertilisers, Mysore, on the 30th January 1941.

Acknowledged.

1) Ack.
2) Submit with a note to Chairman for his formal

I have the honour to be,
Sir,
Your most obedient servant,

BRamaRao

DIRECTOR,
Mysore Geological Department.

THE SECRETARY INDUSTRIAL RESEARCH BOARD OFFICE BANGALORE. No. 93 Date 2/2/41

2/2/41

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CB.

Proceedings of the meeting of the Committee for Potassium Permanganate held at Mysore, at the office of the Director, Mysore Chemicals and Fertilisers, at 9 A.M. on Thursday the 30th January 1941.

Present

Mr. S.G. Sastry, Director, Sandal Oil Factory,

Dr. K.R. Krishnaswamy, Technical Adviser, Government Bichromate Factory,

Mr. B. Rama Rao, Director of Geology (Convenor).

Absent

Mr. E.V. Ganapathy Iyer, Government Director, Industrial Concerns.

The Committee reviewed the final report of Mr. L.S. Chandrakant, Research Scholar, who had been entertained by the Geological Department to conduct investigations regarding the utilisation of the low grade manganese ores of Mysore for preparing Potassium Permanganate, and also Dr. K.R. Krishnaswamy's comment on the report. The Committee agreed with the views which Dr. Krishnaswamy had expressed in his note. Mr. S.G. Sastry informed the Committee that his discussion with some Industrial Chemists at Benares and Calcutta led him into conclusions similar to those expressed by Dr. Krishnaswamy.

After some more discussions relating to the utilisation of the Mysore manganese ores, it was resolved that in view of the limited demand for Potassium Permanganate in India, at present, and also in view of the possibility of even this demand dwindling still further it would be risky to undertake

the scheme independently. The Committee suggests that the scheme may be forwarded to the Government Bichromate Factory so that if and when an opportunity occurs the manufacture of Potassium Permanganate may be taken up as an extension of the work of the Bichromate Factory as it is considered that the ~~processes~~ operations are allied in some respects.

B Ramadas 1.2.41

C O N V E N O R.

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2c 4 February 1

M. Venkatesa Iyengar, Esq., M.A.,
Secretary to the Government of Mysore,
Development Department, Bangalore.

Subject: Manufacture of Potassium Permanganate.

I am directed to send herein enclosed, for the information of Government, a copy of the proceedings of the Potassium Permanganate Sub-Committee.

I have the honor to be,

Sir,

Your most obedient servant,

SECRETARY.

The brief review of work done by the sub-committee was read out and the proceedings of the sub-committee were recorded. The scheme submitted by Mr. P. S. Narayana, Consulting Industrial Geologist, on the manufacture of Graphite products in the State (forwarded by Government) had been considered by the sub-committee which was of opinion that the scheme was superficial, wanting in details. The Board accepted the opinion of the sub-committee.

The Chairman, Mysore Iron and Steel Works, gave a brief account of the experiments conducted at Bhadravati re : Graphite Electrodes and said that the results of experiments were very encouraging. After discussion, the following resolutions were adopted :--

(1) that the experiments on Graphite Electrodes etc., at Bhadravati should be continued expeditiously.

(2) that the facilities required to continue the experiments might be given to the Officers of the Mysore Iron & Steel Works at the Government Electric Factory.

(6) Manufacture of Plastics.

PERSONNEL.

(1) Mr. V. Rama Rau, B. Sc., Government Electric Factory. (Convenor),

(2) Mr. Mohamadali, B.Sc., Mysore Iron & Steel Works.

(3) Mr. V. Paul, M.Sc., Mysore Iron & Steel Works.

(4) Mr. M. Srinivasaiya, B.A., F.I.I.Sc., Indian Institute of Science.

(5) Mr. S. G. Sastry, B.A., M.Sc. (Lond.), Director of Sandalwood Oil Factory.

The Chairman, Mysore Iron & Steel Works, gave a brief account of the work done at Bhadravati so for. He informed the members that the formaldehyde plant had since been erected, and the production of powder in the pilot plant was about 50 lbs. a day for the present.

The mouldings taken out from phenol formaldehyde powder recently manufactured at Bhadravati were then examined, and they were found to be satisfactory. The Chairman pointed out that phenol powders might be first perfected before taking up other compositions, and that the sub-committee should actively and promptly pursue the matter and also keep in touch with the experiments conducted at Bhadravati.

The question of the manufacture of plastics with shellac base was also considered. The Director, Sandalwood Oil Factory, explained that the scheme was not one of economic importance to the State, as quantities of raw materials such as Lac, wood-flour, etc., were not available locally. It was resolved to drop the subject.

(7) Manufacture of Potassium Permanganate.

PERSONNEL

(1) The Director of Geology (Member and Convenor).

(2) The Director of Sandalwood Oil Factory.

(3) The Government Director, Industrial Concerns.

(4) Dr. K. R. Krishnaswamy, B. A., D. Sc., F. I. C., Indian Institute of Science.

The report of Mr. L. S. Chandrakanta, Research Scholar of the Mysore Geological Department and the proceedings of the Committee were recorded. The Director, Sandalwood Oil Factory, stated that the Research Scholar had tackled the subject very well and the very approach of the subject was novel and instructive. The work of the Research Scholar was noted with satisfaction. The recommendation of the Committee to refer the scheme to the Government Bichromate Factory to take it up as an extension of work at a suitable opportunity was approved.

(8) Manufacture of Cement Asbestos.

PERSONNEL.

(1) Mr. B. Rama Rau, M.A., D.I.C., F.G.S., Director of Geology (Convenor).

(2) Mr. S. G. Sastry, B.A., M.Sc. (Lond.), Director of Sandalwood Oil Factory.

(3) Mr. M. K. Narasimhan, B.A., Cement Factory.

The Director of Sandalwood Oil Factory stated that he was taking action to dipsose of the existing stock of asbestos. The Chairman enquired if there was any scope for the manufacture of Boiler composition from asbestos and whether it would not thrive as small scale industry. The subject was discussed in detail. The question of adequate supplies of raw material—asbestos—came up and the Secretary invited the attention of the Board to the Administration Report of the Mysore Geological Department for the year 1938-39 where it was stated that in Idegondanahalli area, Hole-Narasipur taluk, 8,000 tons of asbestos had been located. It was considered desirable and necessary to utilise the raw material locally available to the best advantage.

The Chairman, Mysore Iron & Steel Works brought to the notice of the Board that the possibilities of manufacturing asbestos pipes might be examined, in view of the demand for military and other works.

It was finally resolved to request the sub-committee to examine the question of manufacture of Asbestos Boiler composition and also that of manufacture of asbestos cement pipes and favour the Board with its views.

(9) Manufacture of Abrasives.

PERSONNEL.

(1) The Director of Geology, (Member and Convenor).
(2) Dr. J. C. Ghosh, Director, Indian Institute of Science.
(3) Mr. P. S. Narayana, Cunsulting Industrial Geologist.
(4) The Government Director, Industrial Concerns.

Proceedings of the sub-committee and Government Orders No. D. 2908-11—I. & C. 230-40-8 dated 23rd December 1940 and No. D. 3468-69—1. & C. 230-40-16 dated 24th January 1941 sanctioning Rs. 2,000 and Rs. 500, respectively to Mr. P. S. Narayana, Consulting Industrial Geologist, on the recommendations of the Board, were read and recorded. The Director of Industries and Commerce pointed out that samples of abrasive articles prepared by Mr. Narayana were not satisfactory. The Chairman observed that the Director of Geology was in direct touch with Mr. Narayana and will report further on the progress of the investigations.

(10) Manufacture of Chemicals, Drugs and Essential Oils.

PERSONNEL.

(1) *Sastravaidyapravina* Dr. S. Subba Rao, B.A., M.B.C.M., L.R.C.P., D.P.H., (Chairman).
(2) Dr. B. T. Narayana, Agricultural Chemist.
(3) Mr. B. H. Krishna, Industrial and Testing Laboratory.
(4) Dr. B. L. Manjunath, Central College.
(5) Dr. P. C. Guha, Indian Institute of Science.
(6) Dr. L. S. Doraswami, Economic Botanist.
(7) Mr. M. S. Krishna Rao, Government Soap Factory.
(8) Dr. M. N. Ramaswamy, Forest Research Laboratory.
(9) Mr. B. Sanjeeva Rao, Indian Institute of Science.
(10) Mr. V. Venkatachar, Assistant Director of Industries and Commerce, (Secretary).

The report of the sub-committee was recorded. The Chairman remarked that the subject was a very important one and that necessary immediate action on the resolutions of the sub-committee might be taken and pursued.

The Director of Sandalwood Oil Factory said that Mr. Sundara Rao of Mysore—a gentleman with experience in the cultivation of essential oil plants—whom he consulted, was of opinion that the land of the Sandalwood Oil Factory at Mysore was not good for geranium cultivation. He also mentioned that Mr. B. V. Pandit of Nanjangud himself a large consumer of geranium oil, had imported cuttings from Yercaud and planted them at Nanjangud. At this stage the subject proposed by the Superintendent, Government Soap Factory, re: cultivation of patchouli and geranium in the factory (subject No. IV (E)) was also considered. The Chairman pointed out that the Forest and Agricultural Departments who are placed in a better position might be asked to take necessary

immediate action to grow the herbs and other essential oil bearing plants including patchouli and geranium as recommended by the sub-committee in their report placed for discussion, and the departments might also be requested to arrange if possible for the cultivation of these plants in an experimental plot at Balehonnur and Kemmangundi.

The Chairman also desired that Mr. S. G. Sastry, might be requested to publish a phamphlet *re*: Geranium containing full information with regard to its importance, etc., for being circulated and given publicity in the State.

The Chairman desired to know the progress with regard to Vitivert cultivation and called for a report.

(11) Production of Cinchona.

The report of the Chief Conservator of Forests and also that of Dr. M. N. Ramaswamy, Forest Research Chemist were placed before the House and recorded.

(12) Sulphur.

The report of the Director of Geology in Mysore was recorded.

(13) Manufacture of Urea.

PERSONNEL

(1) The Government Director of Industrial Concerns (Member and Convenor).
(2) The Director of Sandalwood Oil-Factory.
(3) Dr. J. C. Ghosh, D.Sc. F.N.I. Director, Indian Institute of Science.
(4) Dr. V. Subrahmanyan, D.Sc., F.I.C., Indian Institute of Science, Bangalore.
(5) Dr. B. T. Narayanan, Agricultural Chemist.

The Chairman stated that a separate sub-committee was recently constituted to examine the possibilities of the manufacture of Urea.

The Director of Sandalwood Oil Factory explained the importance of Urea specially in plastics industry. He was of the opinion that a whole time chemist should be appointed to conduct experiments. It was pointed out that experiments had already been conducted at the Indian Institute of Science for conversion of compressed Ammonia into Urea and that Dr. Ghosh, Director of the Institute, would be glad to place the results before the committee subject to the conditions that might be laid down by the Government of India. The Chairman remarked that it was unnecessary to duplicate the work since the results of experiments at the Indian Institute of Science might be made available and the appointment of a whole time chemist was therefore not necessary. He, however, suggested that any-one of the chemists either at Belagola or at Bhadravati might be given facilities for experiments.

MISCELLANEOUS.

Utilisation of Molasses for the recovery of potash salts.

The reply received from the Secretary, Mysore Sugar Company, Ltd., was read. The Chairman observed that the question might be actively pursued and the Sugar Company requested to expedite their views in the matter.

The following subjects on the agenda were deferred for consideration at the next meeting for want of time.

(1) Compilation of information re: Industrial Researches in the State.
(2) Scope and Functions of the Research Board.
(3) Consideration of subjects proposed by:
  (*a*) Government Director, Industrial Concerns—Manufacture of glass bulbs, silk worm gut, etc.
  (*b*) Director of Industries and Commerce,—Suggesting that certain items of researches taken up by the Government of India may also be taken up here.
  (*c*) General Manager, Government Electric Factory.—Utilisation of steel shavings.
  (*d*) Manager, Mysore Spun Silk Mills, Ltd, Channapatna—Manufacture of bobbins, shuttles, etc., etc.,
  (*e*) Dr. A. V. Varadarajaiengar, B.A., D.Sc., A.I.E. Indian Institute of Science—Manufacture, of starch from sweet potato.

The Chairman thanked the members for their useful suggestions and the meeting terminated.

K. PARTHASARATHI,
Secretary.

N. MADHAVA RAU,
Chairman.

WD 1803—GPB—100—21-4-41.

Confidential

INDUSTRIAL RESEARCH BOARD

Proceedings of the Second Meeting of the Industrial Research Board Sub-Committee, held on Saturday the 15th March 1941 at 1 p.m. at the Chambers of the First Member of Council.

PRESENT

Rajamantrapravina N. Madhava Rau, Esq., B.A.,B.L.,
First Member of Council. (*Chairman*).

MEMBERS

1. Mr. M. Venkatanaranappa, B.A.,
   Chairman, Mysore Iron & Steel Works, etc., Bangalore.
2. Mr. S. G. Sastry, B.A., M.Sc., (Lond.),
   Director, Sandalwood Oil Factory, Mysore.
3. Mr. B. G. Appadurai Mudaliar, B.A.,B.Sc.,A.M.I.,Mech. E.,
   Director of Industries & Commerce in Mysore, Bangalore.

   Mr. K. Parthasarathi, B.A.,
   General Manager, Government Electric Factory, Bangalore.
   (*Secretary*).

ATTENDED BY INVITATION

1. Mr. M. Venkatesa Iyengar, M.A.,
   Secretary to the Government of Mysore,
   Development Department, Bangalore.

ABSENT

1. Mr. E. V. Ganapati Iyer, B.Sc.,
   Government Director of Industrial Concerns, Bangalore.

AGENDA

1. Brief review of work done by various sub-committees.
2. Compilation of information *re* Industrial Researches in the State.
3. Scope and Functions of the Research Board.
4. Consideration of subjects proposed by:—

(*a*) Government Director of Industrial Concerns—Manufacture of glass bulbs, silk, worm guts, etc.

(*b*) Director of Industries & Commerce—suggesting that certain items of researches taken up by the Government of India may also be taken up here.

(*c*) General Manager, Government Electric Factory—Utilisation of steel shavings.

(*d*) Manager, Mysore Spun Silk Mills, Ltd., Channapatna—Manufacture of bobbins, shuttles, etc.

(*e*) Superintendent. Government Soap Factory—Cultivation of patchouli and geranium in the factory nursery.

(*f*) Dr. A. V. Varadarajaiengar, B.A., D.Sc., A.I.C., Indian Institute of Science—Manufacture of starch from sweet potato.

5. Any other Subjects.

GENERAL

The Chairman invited reference to the agenda circulated to members and said that the review of work done by the several sub-committees may be taken up for consideration.

Manufacture of Super-phosphates

PERSONNEL

(1) Dr. J. C. Ghosh, D.SC., F.N.I., Director of Indian Institute of Science, Bangalore. (CONVENOR)

(2) Mr. S. G. Sastry, B.A., M.SC., (Lond.), Director, Sandalwood Oil Factory, Mysore.

(3) Dr. K. R. Krishnaswamy, B.A.,D.Sc., (Lond.), F.I.C., Indian Institute of Science, Bangalore.

(4) Mr. E. V. Ganapati Iyer, B.Sc., Government Director of Industrial Concerns, Bangalore.

The proceedings forwarded by Dr. Ghosh, Convenor of this sub-committee, were read and recorded. The Director, Sandalwood Oil Factory, explained the work done by the sub-committee so far. It was resolved that further action might be taken in light of the sub-committee's report.

After general discussions, the chairman suggested that the Managing Director, Mysore Chemicals & Fertilisers, Ltd., might be asked to ascertain any reduction in the freight for the transport of bones from Goribidnur, Bangalore and other important outlying stations to Belagola would be helpful and what traffic could be promised.

(2) Manufacture of Hydrated Lime.

PERSONNEL.

(1) Mr. B. Rama Rau, M.A., D.I.C., Director of Geology in Mysore, (Convenor).

(2) Dr. H. S. Sharma, Ph.D. (Lond.), D.I.C. (Lond).. Chemist, Mysore Paper Mills, Ltd.

(3) Mr. V. Balakrishna, B.A., General Manager, Mysore Paper Mills, Ltd.

(4) Mr. G. Gundu Rao, M.Sc., A.I.I.Sc., Mysore Sugar Company, Ltd.

(5) Mr. M. M. Ganapati, Superintendent, Chemical Plant, Mysore Iron & Steel Works.

The Director of Industries and Commerce stated that the experimental batch of hydrated lime from kankary limestone was found by the Mysore Sugar Company to be as good as the imported variety.

The Chairman remarked that the Director of Geology might be requested to forward a detailed up-to-date report on the investigations *re* hydrated lime. It was also decided that the experiments should be continued at Bhadravati till definite results were obtained.

(3) Manufacture of Magnesite Bricks.

It was decided that as resolved in the last Board meeting further experiments might be conducted at the Porcelain Factory, when the tunnel kiln was ready and the Government Director, Industrial Concerns, be requested to take necessary action in the matter and send his report.

(4) Manufacture of Caustic Soda.

PERSONNEL.

(1) Mr. E. V. Ganapati Iyer, B.Sc., Government Director of Industrial Concerns, (Convenor)

(2) Mr. S. G. Sastry, B.A., M.Sc., (Lond.), Director of Sandalwood Oil Factory.

(3) Dr. B. K. Ram Prasad, M.A., (Hon.), D.Sc., M.I.E., Government Electrical Department.

(4) Dr. K. R. Krishnaswamy, B.A., D.Sc., F.I.C., Indian Institute of Science.

(5) Mr. B. Rama Rau, M.A., D.I.C., F.G.S., Director of Geology in Mysore.

The proceedings of the sub-committee were recorded. It was noted that the sub-committee had requested Dr. Krishnaswamy to draw up a scheme in consultation with Mr. S. G. Sastry, for the consideration of the sub-committee. It was decided to await the further report of the sub-committee.

(5) Manufacture of Graphite Electrodes and other Products.

PERSONNEL.

(1) Mr. D. V. Krishna Rao, B.A., Mysore Iron and Steel Works, (Convenor).

(2) Dr. B. K. Ram Prasad, M.A. (Hon.), D.Sc., M.I.E., Government Electrical Department.

(3) One Chemist from the Mysore Paper Mills, Ltd.

(4) One from the Indian Institute of Science.

Government of Mysore,

Industrial Research Board,

No. 545-13/40-41 Bangalore, Dated, 27th March 1941.

From

K. Parthasarathi, Esq., B.A.,
Secretary, Industrial Research Board,
Mysore Road, Bangalore.

To

Sir,

Subject: Sub-Committee - Meetings.

I am directed to ~~ifare~~ inform you that the date of the Sub-Committee meetings are not intimated by some of the Convenors. I am therefore desired to request you to be so good as to keep the Board informed of the engagements of the Sub-Committees as and when the meetings areconvened.

I have the honor to be,
Sir,
Your most obedient servant,

Parthasarathi

SECRETARY.

I. R. B. 6]

SUBJECT Manufacture of Potassium Permanganate

No.

To The Director of Geology

Date of issue ..

Signed by

Sir,

The Board have seen the recommendations of the Sub Committee to effect the Scheme for the manufacture of Potassium Permanganate to the Govt Bichromate Factory. ~~to enable the Factory to take it up as an extension of work~~ I am directed to request you kindly to take necessary action

in the matter.

I. L.

Ley

List of enclosure.

Copied by

Examined by

WD 01343—GPB—75) -4-1-11

577/1951

4th April 1

B. Rama Rau, Esq., M.A., D.I.C., F.G.S.,
Director of Geology in Mysore,
Bangalore.

Subject: Manufacture of Potassium Permanganate

The Board have accepted the recommendations of the Sub-Committee to refer the scheme on the manufacture of potassium permanganate to the Government Bichromate Factory, to enable the Factory to take it up as an extension of work at a suitable opportunity.

I am directed to request you kindly to take necessary action in the matter.

I have the honor to be,
Sir,
Your most obedient servant,

SECRETARY.

L.S.CHANDRAKANT
RESEARCH CHEMIST.

SCIENTIFIC AND INDUSTRIAL
RESEARCH
GOVERNMENT TEST HOUSE
ALIPORE. CALCUTTA.

1 st. August 1941.

THE SECRETARY

SCIENTIFIC AND INDUSTRIAL RESEARCH
BUREAU
GOVERNMENT OF MYSORE. BANGALORE

SIR

I shall be highly thankful to you, if you will send me early a copy of the report of the sub-committee appointed by the Government of Mysore, in connection my scheme for the manufacture of potassium per manganate.

Hoping to hear from you early,

I remain

Sir

Your most obedient servant

L. S. Chandra Kant

No 38/41-42 8
Date 6-8-1941
Bangalore

Complied.
6/8

Subdt.
The letter is acknd
and his request
will be complied with
on Mr. Ranganathan's return
6/8 Yes. 6/8

wb2
acknd
6/8

S.N. Putcha.
18/8/41.

(Board of Industrial Planning and Coordination)

22nd Aug. 1

87

L.S. Chandrakant, Esq., M.Sc.,
Research Chemist, Scientific and
Industrial Research, Govt.Test House,
Alipore, Calcutta.

Dear Sir,

Subject: Potassium Permanganate.

With reference to your letter dated 1st Aug.41, requesting for a copy of the report of the Sub-Committee on the above scheme, I write to state that the findings of the Sub-Committee are treated as confidential. I very much regret I am unable to comply with your request.

Yours faithfully,

SD. K.Parthasarathi.

SECRETARY.

88/41-2

Copy of the above is forwarded with compliments to the Director of Geology in Mysore, Bangalore for information.

Secretary.

Proceedings of the Government of His Highness the Maharaja of Mysore.

Read:

Correspondence ending with letter No.G.9652-58 dated 1st February 1941 from the Director of Geology forwarding a report of Mr L.S. Chandrakanta on the investigations conducted by him into the possibility of manufacturing permangante of potash in the State, together with the views of the special committee consisting of the marginally noted officers constituted to examine and report on the question.

1) The Government Director, Industrial Concerns.
2) The Director, Sandal Oil Factory.
3) The Director of Geology.
4) Dr.K.R.Krishnaswamy of the Indian Institute of Science.

2. Un-official note no.1753 dated 8th August 1941 from the Government Director, Industrial Concerns, furnishing his remarks on the report of Mr.L.S. Chandrakanta.

O r d e r No.D.885-7'I&C.184-40-4(a)

Dated, Bangalore, the 16th August 1941.

Recorded with the observation that more investigations into the possibility of manufacturing the chemical should be carried out and definite results ascertained.

2. The Government Director, Industrial Concerns, is requested to arrange for the above investigations being carried out at the Government Dichromate Factory, Belagola when more kilns are put in there and circumstances permit of utilising one of them for this work and to submit a further report in the matter.

sd.George Matthan.
For Secretary to Government.
Development Department.

To

The Government Director, Industrial Concerns,
The Director, Sandal Oil Factory,
The Director of Geology in Mysore.

"COPY"

(Board of Industrial Planning and Coordination.

OFFICE OF THE SECRETARY INDUSTRIAL P...
No. 627/41.E
Date 24/11/41
one file.

Manufacture of Potassium Permanganate.

Dated, 22nd November 1941.

Returned with compliments

Refce. Para 15 - Minister's minutes.

The papers were placed before the Board at the meeting held on the 5th September 1941. The Government Director Industrial Concerns stated that as per orders of Government, he would arrange for further experiments being conducted at the Government Bichromate Factory, Belagola, immediately the kiln was ready. His report is awaited.

Dep. Secy.
Dep No. 41/41.2
Dated 22.8.41.

O/N

This has reference to the Secretariat file under Subject which had been referred to the Board for further Consideration as per minister's minute Para 15 - in the Secretariat file. The file is referred to Secretariat.

22/11/41

Secretary
Board of Industrial
Planning & Coordination

(Development Secretary)

Tels.—"INDUSCOM."
Phone—2004.

GOVERNMENT OF MYSORE
DEPARTMENT OF INDUSTRIES AND COMMERCE.

Mr. S. G. Sastry, B.A., M.Sc.(Lond.),
Director. OFFICE OF THE DIRECTOR,

D. O. No. C_1-Eng. 660/41-42 *Bangalore, dated the* ....22nd June 1942.....

23/6 CONFIDENTIAL.

The Secretary,
Board of Industrial Planning & Co-ordination,
Old Public Offices, Bangalore.

Dear Sir,

Manufacture of Potassium Permangnate.

I enclose herewith copy of a letter which I have received from Mr. S.S. Khera, I.C.S., Director of Industries & Commerce, United Provinces, Cawnpore, on the above subject. May I request you to kindly let me know if I may supply the details of the scheme?

I have simply acknowledged the letter of Mr.S.S. Khera and stated that I shall write to him again in the course of a few days.

I request instructions.

Yours sincerely,

SECRETARY.
BOARD OF INDUSTRIAL
PLANNING & CO-ORDINATION.
JUN 24 1942
No XX

SGS:ATK)

S. N. Patel.
24/6

"COPY"

D.O. No.5316/C-XVIII-M-17 dated June 15, 1942 from S.S. Khera, Esq., I.C.S., Director of Industries & Commerce, United Provinces, Cawnpore, to the Director of Industries & Commerce in Mysore, Bangalore.

The report of the Industrial Research Board Sub-Committee of Mysore, attached to the proceedings of the Sixth Meeting of the Board of Scientific and Industrial Research, held on the 21st and 22nd January 1942 mentions the development of the electrolytic production of Potassium Permangnate. I would be grateful for the details of the process, as the United Provinces Government are interested in the production of potassium permangnate.

Director of Industries & Commerce
in Mysore, Bangalore.

d/22.6.42.

atk)

WD 07011—GPB—75,000—26-5-42

SECRETARY,
BOARD OF INDUSTRIAL
PLANNING & CO-ORDINATION.
JUL 23 1942
4.30 p.m.
Dy No. 44/42-3

C. F. No. 40]

194

From

The Director of Geology
in Mysore,
Bangalore.

To

The Secretary,
Board of Industrial Planning
& Co-ordination,
Bangalore.

Dated

23rd July 1942.

Despatched

Received

~~General~~ No. 9652-91
No.

Enclosure No. Two

Sir,

With reference to your telephone message of this morning, I have the honour to send you herewith the report in original of Mr. L.S.Chandrakant on the results of his investigations on the preparation of Potassium Permanganate from Mysore manganese ores. This may kindly be returned to me as soon as it is done with.

A copy of the resolution of the Sub-Committee who ~~have~~ been appointed to examine this question is also enclosed, as desired.

I have the honour to be,
Sir,
Your most obedient servant,

B.Rama Rao

DIRECTOR,
Mysore Geological Department.

Ar.23/7.

Proceedings of the meeting of the Committee for Potassium Permanganate, held at Mysore, at the office of the Director, Mysore Chemicals and Fertilisers, at 9 a.m. on Thursday the 30th January 1941.

Present

Mr. S. G. Sastry, Director, Sandal Oil Factory,

Dr. K. R. Krishnaswamy, Technical Adviser, Government Bi-chromate Factory,

Mr. B. Rama Rao, Director of Geology (Convenor).

Absent

Mr. E. V. Ganapathy Iyer, Government Director, Industrial Concerns.

.....

The Committee reviewed the final report of Mr. L. S. Chandrakant, Research Scholar, who had been entertained by the Geological Department to conduct investigations regarding the utilisation of the low grade manganese ores of Mysore for preparing Potassium Permanganate, and also Dr. K. R. Krishnaswamy's comment on the report. The Committee agreed with the views which Dr. Krishnaswamy had expressed in his note. Mr. S. G. Sastry informed the Committee that his discussion with some Industrial Chemists at Benares and Calcutta led him into conclusions similar to those expressed by Dr. Krishnaswamy.

After some more discussions relating to the utilisation of the Mysore manganese ores, it was resolved that in view of the limited demand for Potassium Permanganate in India, at present, and also in view of the possibility of even this demand dwindling still further it would be risky to undertake the scheme independently. The Committee suggests that the scheme may be forwarded to the Government Bi-chromate Factory so that if and when an opportunity occurs the manufacture of Potassium Permanganate may be taken up as an extension of the work of the Bi-chromate Factory as it is considered that the operations are allied in some respects.

(Sd) B.Rama Rao,
C O N V E N O R.

'C O P Y'

B Ramarao 23/7/42
D I R E C T O R,
Mysore Geological Department.

Ar.23/7.

28th July 1942.

I.P. 62/42-3.
One file.

Confidential.

The Director of Geology in Mysore, Bangalore.

Re: Potassium Permanganate.

In inviting kind reference to your letter No.9652-91 dated 23rd July 1942, on the above subject, I am directed to return with thanks the original report of Mr.L.S. Chandrakanta on the results of investigations on the preparation of Potassium Permanganate from Mysore manganese ores, sent therewith. The receipt of the file may kindly be acknowledged.

I have the honor to be,
Sir,
Your most obedient servant,

28/7

Secretary.

28/7

Dj 44

G.R.S. EI—3]

BOARD OF INDUSTRIAL
PLANNING AND COORDINATION ROUTINE NOTES

[To be used only for notes, requisitions, etc., not intended for permanent record.]

Ref: Remarganate file

I am the Dei & Geo.
No. 9652-91 dated 23.7.42

The connected Board
& Dte file have been
submitted to the Minister
for orders. A copy of the
original report is
available in the Dte
file. The file must be
returned further Dei &
Geo: with if also
be returned to him
when it is no longer
required here

Furnished

Jh
25/7/42

YS for
25.7.42

D & T letter to the
Dei & Geo returning the
file put up for signature.

To the Dei & Geo.

Returned as desired
file refers to above
Jh 28/7

Jh
28/7/42

MLS for
28.7.42

N. B.—Should routine notes be written on small slips, the notes must be copied, or slips pasted on this form.

WD 078—GPB—30,000—25-7-40

I. R. B. 6]

SUBJECT Manufacture of Potassium Permanganate

Confl

No.

To

.....

.....

.....

Date of issue .....

Signed by .....

Dear Sir,

With reference to your D.O. letter No. C/- Eng 660/41-2 dated 22/23rd June 1942 on the subject I am directed to inform you that as the scheme has not yet assumed a final shape ~~Shape~~, it is not desirable to furnish details of the scheme and to request that a suitable reply may be sent to the Dir of Ind. Limited Secy.

Yours faithfully,

for

S. G. Sastri Esq. Bdtch 28.7.42

P.T.O.

1) Copy to Dir of Geology
for info.

~~Sec~~

~~2 Copy to~~ Sec 4.

27/7/52

List of enclosure.

Copied by

Examined by

WD 01343—GPB—750—4-1-11

I.P. 63/42-3. 29th July 2

Mr. T.Shamanna,M.A.,
xxxxxxxxxxxxxxx

Confidential.

Dear Sir,

Subject: Manufacture of Potassium Permanganate.

With reference to your D.O.letter No. C1-Enq.660/41-2 dated 22/23rd June 1942 on the subject, I am directed to inform you that as the scheme has not yet assumed a final shape, it is not desirable to furnish details of the scheme and to request that a suitable reply may be sent to the Director of Industries & Commerce, United Provinces, Cawnpore.

Yours sincerely,

sd. T. Shamanna.

S.G. Sastry, Esq.,B.A.,M.Sc.,(Lond),
Director of Industries and
Commerce in Mysore, Bangaloro.

HSR)

p.t.o.

No.I.P. 64/42-3 Dated, 29th July 1942.

Confidential.

Copy of the foregoing is forwarded with compliments to the Director of Geology in Mysore, Bangalore for information.

for 29.7.42

Secretary.

WD 67011—GPB—75,000—23-5-42

C. F. No. 40]

194 .

From

The Director of Geology
in Mysore,
Bangalore.

To

The Secretary,
Board of Industrial Planning
and Co-ordination,
Bangalore.

SECRETARY
BOARD OF INDUSTRIAL
PLANNING & CO-ORDINATION
11 1942
No. 66

Dated 30th July 1942.

Despatched

Received

~~General~~ No. 9652-95.
No.

Enclosure No.

Sir,

With reference to your letter No.I.P.62/42-3 dated 28th July 1942, I have the honour to acknowledge the receipt of the original report of Mr. L.S. Chandrakant on the results of investigations on the preparation of Potassium Permanganate from Mysore manganese ores, returned therewith.

I have the honour to be,
Sir,
Your most obedient servant,

B Ramadevo

DIRECTOR,
Mysore Geological Department.

Ar.30/7.

I. R. B. 6]

SUBJECT Parawin Pension Scheme - Scheme of Mr. L.S. Chandrakanta.

No.

To The Govt. Dir. Ind. Concern.

Date of issue ..

Signed by

Sir,

In inviting a kind reference to G.O No. D.885-7/91 184-40-4 dated 16.8.41 and the decision given Board at the meeting held on 5.9.1941, on the subject, I am directed to request you to kindly expedite action in the behalf matter of conducting further investigations as suggested by you at the Dichomali factory at Belagola.

1) Fair Copy submitted separately.

2) Cuttack file for perusal. The note has been recorded in the Cuttack file & put up for approval before returning the file to the Bd. after noting in the Board's diary.

7.8.41

7/8/41

Below file.

The present position may
kindly be intimated
Sd/-
5/8/42
Sec'y.

JH/3
5/8/42

Draft Note to be
recorded in the file
(Initial).

The Govt. of India
has been requested
to expedite action
in the matter
Conducive further
with reference
to the List of enclosure. dt 16.8.42

Draft
JH/3
5/8/42

Recorded in the
file
Secretary
JH/3
7/8

Copied by

Examined by

WD 01343—GPB—750—4-1-11

8th August 1942.

I.P. 78/42-3

The Government Director, Industrial Concerns,
Bangalore.

Subject: Manufacture of Potassium Permanganate -
Scheme of Mr.L.S.Chandrakanta.

In inviting kind reference to G.O.No.D.885-7/I&C-184-40-4 dated 16th August 1941 and the decision of the Board at the meeting held on the 5th September 1941, on the subject, I am directed to request you to kindly expedite action in the matter of conducting further investigations as suggested by you at the Dichromate Factory, Belagola.

The present position may kindly be intimated.

I have the honor to be,
Sir,
Your most obedient servant,

Secretary.

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE.

SECRETARY.
BOARD OF INDUSTRIAL
PLANNING & COORDINATION
SEP 8 1942
No 1116

General and Revenue Secretariat.

No. 81839

Bangalore, dated 7 September 1942

FROM

~~The Secretary to the Government~~ *of His Highness the Maharaja of Mysore.*
Development Department.

To

The Secretary,
Board of Industrial Planning & Coordination,
B a n g a l o r e.

Subject Manufacture of Portarium Pamanganate

S i r,

I am directed to invite reference to your Office No. No.627/41-42 dated 24th November 1941 on the above subject and to request that the submission of the promised report may kindly be expedited.

I have the honour to be,
S i r,
Your most obedient servant,

For Secretary to Government,
Development Department.

A.N.

I.P./52

24th Septr. 2

Mr.T. Shamanna,M.A.,
xxxxxxxxxxxxxxx

Dear Sir,

Subject: Manufacture of Potassium Permanganate.

In inviting kind reference to this office letter No.I.P.72/42-3 dated 8th August 1942, on the subject, I am directed to request you to be so good as to arrange to intimate the present position in the matter.

Yours sincerely,

sd.T. Shamanna.

E.V. Ganapati Iyer,Esq.,B.Sc.,
Government Director,
Industrial Concerns,
Bangalore.

p.t.o.

No.I.P. /53 /42-3 dated, 24th Septr.1942.

Copy to the Secretary to Government, Development Department, Bangalore for favour of information with reference to No.D.1839 dated 7th September 1942.

for Secretary.

I.F. 358

General & Revenue Secretariat,
8th December 2

Mr.T. Shamanna,M.A.,
[redacted]

Dear Sir,

Subject: Manufacture of Potassium Permanganate.

I am directed to invite kind reference to letter No.I.F.79/42.3 dated the 6th August 1942 and to subsequent reminder on the 24th September and to request you to be so good as to intimate how the matter stands at present.

Yours sincerely,

sd. T. Shamanna.

B.V. Ganapati Iyer, Esq., B.Sc.,
Government Director,
Industrial Concerns, Bangalore.

No. 359 /42-3

Copy to I & C branch.

For
8/12/42

General & Revenue Secretariat,

I.F. December 2

Mr.T. Shamanna, M.A.,
xxxxxxxxxxxxxxxxxx

Dear Sir,

Subject: Magne

I.P. 546/42-3.

17th February 3

Mr.T.Shamanna, M.A.,
xxxxxxxxxxxxxxx

Dear Sir,

Subject: Manufacture of Potassium Permangate.
****

I am desired to invite kind reference to letter No.I.P.79/42-3 dated the 8th August 1942 and to subsequent reminders and to request you to kindly expedite your reply in the matter.

Yours sincerely,

17.2.43

E.V. Ganapati Iyer,Esq.,B.Sc.,
Government Director,
Industrial Concerns,
Bangalore.

Telephone No. 2273.

Mr. V. GANAPATI IYER, B.Sc.,
Government Director,
Industrial Concerns.

UNITED INDIA BUILDINGS,
Sri Narasimharaja Road,
Bangalore City.

SECRETARY.
BOARD OF INDUSTRIAL
PLANNING & COORDINATION.
MAR 2 1943
No 321

Cyl 1279

23rd Feb. 1943.

The Secretary,
Board of Industrial Planning and
Co-ordination, Bangalore.

Dear Sir,

Sub: Manufacture of Potassium Permanganate.

With reference to your letter No.I.P.79/42-3 dated 8th August 1942 and S.P.58/812.42 regarding the above subject, I write to state that I have already instructed the Works Manager, Govt. Dichromate Factory, to take up the work and submit a progress report immediately. To-day he has been reminded to expedite his report. As soon as a report is received from the Works Manager the same will be forwarded to you.

Yours sincerely,

V. Narayanasastry
for Govt. Director,
Industrial Concerns.

Misrd/
Forwarded
Secretary Bd. of Ptn.

Director of Industries & Commerce, Mysore & Ex-Officio Commissioner of Labour in Mysore

No. 1
18 FEB 1943
BANGALORE

BR.

18/2/43

I.P. 599/42-3

15th April 1943.

The Government Director, Industrial Concerns,
Bangalore.

Subject: Manufacture of Potassium Permanganate.

I am directed to invite kind reference to your letter No.C1.1279 dated the 23rd February 1943, on the above subject and to request you to be so good as to forward a report on the progress of work done in the matter of conducting further experiments on the above at the Dichromate Factory.

I have the honor to be,
Sir,
Your most obedient servant,

Secretary.

M. 608/42-3

Copy to I & C branch.

Telephone No. 2272.

Mr. E. V. GANAPATI IYER, B.Sc.,
Government Director,
Industrial Concerns.
No. Gl. 126.

SECRETARY,
BOARD OF INDUSTRIAL
PLANNING & COORDINATION.
AUG 4 1943
No. 17

UNITED INDIA BUILDINGS,
Sri Narasimharaja Road,

Bangalore City, 30th July 1943.

The Secretary,
Board of Industrial Planning
and Co-ordination, Bangalore.

Dear Sir,

Sub: Manufacture of Potassium Permanganate.

In continuation of my letter No.Gl.1279 dated 23rd February 1943 regarding the above subject I write to state that the Works Manager, Govt. Dichromate Factory has stated in his report dated 3rd July 1943 that it is not possible to take up the work with the existing type of furnaces and a separate furnace has to be constructed for this manufacture. He has also reported that as soon as the fifth furnace and other items of work on hand are completed the work will be taken up. The Works Manager has been instructed to start this ~~man~~ investigation immediately.

Yours sincerely,

V. Narayanaswamy

Government Director,
for Industrial Concerns.

BR.

D.P. 292/43-44

11th March 1944.

The Government Director,
Industrial Concerns, Bangalore.

Subject: Potassium Permanganate.

+++

I am directed to invite reference to letter No.D.5273/I&C.219-43 dated the 18th February 1944 of the Secretary to Government, Development Department addressed to you, on the above subject and to request you to be so good as to intimate the action taken in the matter.

The matter may kindly be treated as urgent.

I have the honor to be,
Sir,
Your most obedient servant,

11/3

Secretary.

28 May 1944.

The Government Director, Industrial Concerns,
Bangalore.

Subject: Potassium Permanganate.

+++

I am directed to invite reference to this office letter No.I.P.292/43-44 dated the 11th March 1944, on the above subject and to request you to be so good as to expedite your reply in the matter. The present position may kindly be indicated.

I have the honor to be,
Sir,
Your most obedient servant,

29/5

Secretary.

B. VISWANATH, B.E.
DIRECTOR
ENGINEERING AND CHEMICAL INDUSTRIES

BANGALORE.

Dated 19th September, 1944.

No. 1164/G.D.F.

The Secretary,
Board of Scientific & Industrial Research,
General & Revenue Secretariat,
Public Offices, Bangalore.

Sir,

Subject: Manufacture of Potassium Permanganate at the Government Dichromate Factory.

With reference to your letter No.I.P.107 dated 9th September 1944 regarding the above, I have the honour to state that the experiments conducted in the present furnace did not give any useful data and the conversions were very poor. An order has therefore been placed with the Mysore Iron & Steel Works, Bhadravati, for fabricating a special cast iron furnace. On receipt of the above, further work will be taken up.

I have the honour to be,
Sir,
Your most obedient servant,

B. Viswanath

Director,
Engineering & Chemical Industries.

RVK)

GOVT. DICHROMATE FACTORY, BELAGULA.

Copy of the D.O. letter No.1090 of 25th November 1944 from the Works Manager, Govt. Dichromate Factory, Belaguâa, to Dr.K.A.N.Rau, D.Sc.,(Lond) F.R.I.C., Technical Secretary, Board of Scientific & Industrial Research, Bangalore.

I acknowledge with thanks the receipt of your D.O.No.T.S.139 of 22.11.1944. I enclose herewith the report of the work done by Mr.T.Subramanya, who has been entrusted with the investigational work on the manufacture of Potassium Permanganate.

For the manufacture of Potassium Permanganate pyrolusite and Potassium hydroxide are required. Pyrolsite is available in Mysore State and we have to import Potassium Hydroxide. Potassium Nitrate may also be required, and is available in India.

Potassium Permanganate is used as a reagent in laboratories, oxidising agent in the manufacture of Sacchrin and dye stuff intermediates; as a deodorant, germicide, and disinfectant in pharcuticals; as a bleaching agent in the manufacture of special kinds o. textiles, and paper in the purification of water in Sanitary engineering.

Manufacture of potassium permanganate cannot be taken up as an independent u nit since its consumption in India during peace time is estimated to be nc not more than 200 tons per annuam. It is always better to group it with an allied chemical industry like the dichromate, since its manufacture involves similar processes like roasting, extraction oxidation and crystalisation. It is also a reaction taking place in a solid phase at a temperature of 450-550 C The Government Dichromate Factory, has facilities to carry out and establish the manufacture of chemicals involving reactions at high temperature.

Trial experiments conducted on this manufacture in the dichromate furnaces have not given useful data, since carbondioxide produced by the combustion of oil comes in direct contact with the mass to be roasted. A special muffle type cast iron furnace ordered with Mysore Iron & Steel Works Bhadravati, has been received and will be erected and put into operation as soon as the re-construction of the first furnace is completed, which might take another fortnight.

Mr. T.Subramanya, the Senior Chemist, has been put on this investigational work, and it might take about nine months for him to arrive at definite results.

Total grants requires dor the scheme:-

1. By way of materials already spent for trial experiments	Rs.	220
2. Cost of C.I.Furnace		1,200
3. Erectioncharges and cost of brickwork		250
4. Cost of pyrolusite purchased 2 tons		320
5. Cost of Pot. Hydroxide purchased 2½ tons		1,750
6. Cost of Pot. Nitrate for 1¾ tons		600
7. Probable cost of vessels for handling, dissolving and crystallzing		400
8. Salary of the Chemist for 9 months at Rs.110/= per month		990
9. Bonus to the Chemist which the Board might be pleased to sanction for successful completion of work and to establish a routine production of 2 cwts per day.		400
Total	Rs.	6,130 or 6,200

A sum of Rs.6,200/= might kindly be got sanctioned by the Board.

With best regards.

==========

Copy

==========

Director, 11.12.[illegible]

Engg. & Chemical Industries

VI. G. 7]

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE.

GENERAL AND REVENUE SECRETARIAT.

No. 162, dated the 1-12- 1944.

(J. P.)

To

The Director
Engineering & Chemical Industries
Bangalore.

SUBJECT.

Manufacture of Potassium Permanganate at the Government Dichromate Factory

SIR,

I am directed to invite attention to the marginally noted communication and to request that the Government of His Highness the Maharaja may be informed, in the column opposite of the cause of delay in furnishing a further report and of the approximate date on which reply may be expected.

your Office *No. 1164 G.D.7. dated 19 9/44

7289/2-12-44

W.M. G.D.7 W/C.

I am also to request that the reply to this reminder may be sent ~~not later than the~~ early.

I have, etc.,

Secretary to Government,
B.S.I.R. Department.

*Previous reminders.

REPLY.

No. , dated the 193

DIRECTOR
ENGINEERING & CHEMICAL INDUSTRIES,
BANGALORE.
No. 289 Date DEC 1944

To

The Secretary to the Board of Scientific and Industrial Research
~~Government of H. H. the Maharaja of Mysore~~, Public Offices
..... Department. Bangalore

No. 2113/ 11 DEC 1944

Sir,

Manufacture of potassium permanganate at the Govt. Dichromate factory.

With reference to your letter No. 162 of 1st December 1944 on the above, I have the honour to forward herewith a copy of the report sent to the Tech. Secretary, B.S.I.R. by the Works Manager, Govt. Dichromate factory.

I have etc.,

Director,
Engg. & Chemical Industries

1185 8-12-44

Submitted to Director.

Copy of the report sent to the Technical Sec. B.S.I.R. may be forwarded to Secretary B.S.I.R. also.

7/12.

WD 0285—GPB—7,500—12-9-99

I.P. 47-40-44849

GOVERNMENT DICHROMATE FACTORY, BELAGOLA.

No. 156 dated 12.2.45

ENGINEER ... INDUSTRIES, GALAXE.
No. ... Dated 13 FEB 1945

Submitted to the Director,

Re:- Manufacture of Potasium Permanganate.

With reference to your memo No.F.389 of 8-2-1945, I submit herewith a report given by Mr.T.Subramanyam, for your kind information.

Yours Sreenivasa Rangachar
Works Manager.

2944/Encl/Rain/13/2
13/2/45. Forwarded with compliments
B.S.P. to Engineer B.S.P. with reference to his letter No. 9.P.122/12-44-2
dated 7-2-45 Rain 13/2
Engineer ... Industries.

Submitted

I beg to submit the following note on the actual work done in connection with the investigation on the manufacture of Permanganate.

In the thermo-chemical process of producing permanganate the reaction mixture consisting of caustic potash and pyrolusite ore is roasted in a furnace at 500 - 600° c when the alkali manganate is produced. This manganate is further oxidised into permanganate. As submitted in the previous reports two trial experiments have been run in our present second furnace in which the reaction mixture is directly heated by means of an oil burner. The pyrolusite ore, Sodium hydroxide and potasium nitrate to supply part of the oxygen required for the reaction.

Potassium hydroxide was not available then so Sodium hydroxide was used. Now we have purchased about 1½ tons of KOH to try in the new furnace.

HVS

$$2NaOH + MnO_2 + O \text{ ------- } Na_2MnO_4 + H_2O$$

are mixed in the proportion given below:-

Mixture No.	Pyrolusite ore. cwts.	Sodium Hydroxide. cwts.	Potasium Nitrate.
I	2	2	1/8
II	2	3	1

The mixing has been carried out in a waste heat open pan. This however takes considerable time and the handling of the caustic liquor by hand labour presents difficulties. Hence for regular mixing separate equipment has to be rigged up.

In each of the above trial experiments the mass is roasted at 500 - 600° c for five hours. During this period of roasting the reaction mixture is kept turned over at regular intervals. The mass is pasty

P.T.O.

and after discharge the product gets dried up into hard lumps. The conversion of the pyrolusite ore into manganate is noted below:-

Mixture No.	Temperature of reaction. °c.	Duration of roasting	Percentage of ore converted into manganate
I	500 - 600	5 hours	5%
II	- do -	- do -	10%

From the column No.4 of the above table it is seen that only a maximum of 10% of the ore is converted into the manganate. This is however not satisfactory. For obtaining satisfactory conversion of the pyrolusite ore into the soluble manganate it is necessary to maintain an oxidizing atmosphere in the furnace and keep away any Carbon dioxide. For this purpose a special cast iron furnace has been obtained and the errection of the same is nearing completion. As soon as the same is ready for operation further work will be carried out.

T. Subrahmanyam

B e l a g u l a,
dated 12th Feb.'45.

Rec 15/2

CONFIDENTIAL

BOARD OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

GENERAL AND REVENUE SECRETARIAT.

PROCEEDINGS OF THE FOURTH MEETING OF THE BOARD OF SCIENTIFIC AND INDUSTRIAL RESEARCH HELD IN THE CHAMBERS OF THE MINISTER FOR PUBLIC WORKS AND INDUSTRIES ON MONDAY THE 12TH MARCH 1945 AT 3 P.M.

Present.

1. The Minister for Public Works and Industries (*Chairman*).
2. Sir J. C. Ghosh, D.Sc., F.N.I., Director of Indian Institute of Science.
3. *Dharmaprakasha Rao Bahadur* Devarao Shivaram
4. Mr. S. L. Mannaji Rao
5. The Secretary to Government, Development Department.
6. The Director of Industries and Commerce (and Director of Engineering and Chemical Industries in-charge.)
7. The Director, Sandalwood Oil Factories
8. The Director of Geology
9. The Chief Conservator of Forests
10. The Assistant Secretary to Government, Development Department. (*Secretary*).

By Invitation.

1. The General Manager, Mysore Iron and Steel Works.
2. The Director of Public Health
3. The Chief Electrical Engineer
4. Dr. B. Sanjeeva Rao
5. Mr. N. S. Shankariah
6. Mr. J. P. David

Absent.

1. Sir M. O. Forster
2. Sir C. V. Raman
3. The Commissioner for Economic Development and Planning.

(Letters expressing inability to attend the meeting were received.)

Agenda.

(1) Report of action taken regarding subjects discussed at the previous meeting.

(2) Reports on:—

(i) Resistence alloys.—Mysore Iron and Steel Works.

(ii) Potassium Permanganate—Government Dichromate Factory

(3) Subjects:—

(i) Essential Oils.

(ii) Composition and utilisation of silk Gum.

(iii) Utilisation of Silk Pura

(iv) Investigations regarding starting of the electro-chemical and electro-metallurgical industries in connection with Jog Power Scheme.

(v) Manufacture of starch and glucose—Industrial and Testing Laboratory.

(vi) Manufacture of D.D.T.—Industrial and Testing Laboratory.

(vii) Continuance of expenditure on pyrethrum cultivation in view of the advent of D.D.T.—Proposed by the Chief Conservator of Forests.

(viii) Coffee plastics.—Mysore Iron and Steel Works.

(ix) Any other subjects.

The Chairman in welcoming the members stated, that it was his pleasant duty to welcome the members particularly Sir J. C. Ghosh who had just returned from an extensive tour in the United Kingdom and the U. S. A. With the members the chairman requested Sir J. C. Ghosh to give a concurrence of the brief outline of his experiences, both in England and in the U.S.A.

In the course of an instructive and interesting speech, Sir J. C. Ghosh explained the vast and rapid growth of the industries in the U.K. and U.S.A. and how the war production was being kept at an optimum level and also made useful suggestions as to how our industries could be developed.

The subjects on the agenda were then taken up for consideration.

The report of the Secretary on the action taken regarding the subjects discussed at the previous meeting was read and recorded.

Essential Oils.

A note on the subject had been circulated. The Chairman observed that there was not much progress since the previous meeting.

On the request of the Chairman, the Chief Conservator of Forests explained the work done so far and referred to the

proposals made by the Director of Agriculture in this connection. The proposals for the undertaking of a five years' scheme for the cultivation of essential oil plants and the appointment of a special officer with certain staff were read out. The Chairman observed that the Director of Agriculture was not present to explain the scheme and further discussion was not therefore possible.

The Director of Sandalwood Oil Factories stated that there was no difficulty regarding the distillation of oils and that this work could be taken up with advantage at the Sandalwood Oil Factory and the Government Soap Factory. The main question was that of large scale cultivation of essential oil bearing plants.

The Chairman desired to know whether there was any one who had specialised in this work. He also stated that it would be desirable to take up the distillation of oil from one or two kinds of plants which were already available in the State, apart from extending the cultivation of some plants. At this stage, the Chairman handed over a note given to him by Mr. Sitaramachar on the subject to the Chief Conservator of Forests for study and report in consultation with Sir J. C. Ghosh, if necessary.

The Chief Conservator of Forests stated that the experiments conducted so far had revealed that large scale cultivation of more important herbs such as geranium, vetiver, peppermint and patchouli could be taken up immediately, with advantage. Regarding cinnamon the Chief Conservator of Forests explained that the growth was thinly scattered over a large forest area and that the investigations conducted by the department went to show that it was not economical to take up the cultivation of this herb.

The plan of development of this work under the following four heads, *viz.*,

(1) Encouragement of private plantations by subsidizing them;
(2) Development of Government plantations;
(3) Cultivation of experimental plantations of new essential oil oil plants and flowers;
(4) Distillation of essential oils;

was then considered.

The Director of Industries and Commerce brought to the notice of the Board that influential people in Kolar District

were ready to take up large scale cultivation of these plants provided they were subsidized by Government and that it was better to entrust it to private enterprise than to undertake it at Government cost.

Mr. S. L. Mannaji Rao asked if Government were prepared to grant suitable concessions and financial help to private people who were willing to take up the cultivation. The Chairman stated that it was the policy of Government to encourage private people to take up such work and assured him that reasonable facilities would be given with reference to the merits of each case and that Government would consider the question of giving subsidies also. He mentioned that Mr. Sundara Rao of Hemmanhalli who had alread done some work in this line with the encouragement of Government in the past had again approached Government for a subsidy of Rs. 2.500 per annum for two years to further improve the cultivation.

It was finally decided that in the first instance private people may be encouraged to raise plantations by granting necessary facilities and subsidies and that the question of developing Government plantations and experimental plantations of new essential oil plants and herbs may be decided in consultation with the Director of Agriculture.

Furfural.

The General Manager, Mysore Iron and Steel Works, reported the work done so far and said that the defects in the apparatus used in this connection had since been rectified and that further work in this direction by utilising paddy husk and bagasse was in progress.

The Chairman desired that the work should be pursued promptly and expeditiously and definite results obtained.

The General Manager stated that the experiments had now reached almost the final stage and promised to furnish definite results with his remarks before the next meeting.

Manufacture of Sugar on a Cottage Industry Basis.

The Director of Industries and Commerce explained that the main difficulty was in obtaining the centrifuge required in this connection. The Chairman observed that there was no progress in this matter and that every effort should be made by the Director to push the work through

by getting the required parts manufactured at the Central Industrial Workshop and the Government Electric Factory

The Director of Industries and Commerce promised to have atleast one unit installed and to report the results of its working by the next meeting.

Electro-chemical and Electro-metallurgical industries—investigations.

The Chairman stated that in pursuance of the decisions of the Board at the previous meeting, the conduct of the investigations on abrasives, such as, carborandum, alundum, artificial emery, etc., at the Indian Institute of Science under the supervision and guidance of Dr. B. K. Ram Prasad had been sanctioned. Before the work could be actually commenced, Dr. Prasad left Mysore service. Dr. K. R. Krishnaswamy of the Indian Institute of Science has since been placed in charge and the work is expected to commence soon.

A special staff was also sanctioned to work under the General Manager, Mysore Iron and Steel Works, to collect scientific and commercial data regarding the possibilities of establishing electro-chemical and electro-metallurgical industries in the Jog area. The General Manager said that the work was in progress and promised to get through it expeditiously.

Composition and utilisation of silk gum and Silk Pupa.

Dr. B. Sanjeeva Rao explained the work done by him in this direction. The note received from him had been circulated to the members. He said that two processes for the recovery of sericin had been worked out and that the latest experiments had revealed that sericin could be recovered easily and that the process was simple. The work was stated to be not yet complete. The work regarding par boiling of rice was nearing completion and the investigator would be able to devote his undivided attention hereafter for the work on sericin. He suggested that it was desirable to take up the investigations regarding the recovery of protein from the silkworm pupa.

The Chairman wanted to know the commercial possibilities and the economic aspect of the proposals.

Dr. Sanjeeva Rao stated that as regards sericin it was too early to say what exactly its uses would be. But it was well known that Japan used it in the manufacture of plastics. The investigations on hand had to be completed before any opinion could be given definitely on the economic aspect of the question.

As regards recovery of protein from the pupa he said that it was necessary to do something, because at present after the silk had been reeled off, enormous quantities of pupa were thrown away to crows and vultures or buried in pits. The greatest objection to its being used for any purpose was perhaps its offensive smell. Once they had arrived at a process by which they could eliminate the nasty smell, the rest of it would be easy enough and he was glad to say that a process had been found by which the smell could be eliminated. He therefore urged that the work relating to the recovery of protein from silkworm pupa may be continued. He stated that one investigator would not be able to attend to the work relating to both sericin and this and requested that another investigator be appointed for the purpose.

The Chairman asked, granting that the experiments succeeded, to what uses the protein could be put.

Dr. Sanjeeva Rao stated that in Japan this was being used as food for fish. It might be used as poultry-feed. The question of using it as food for human consumption on account of its high protein value may also have to be investigated. The oil recovered in the process could be used in the manufacture of soaps. He therefore suggested that he might be given the assistance of another investigator exclusively for this work for a period of one year the work being conducted in collaboration with the Chemistry Department of the Central College.

It was finally agreed that the services of Mr. R. S. Subramanyan may be continued for another year on the existing terms to work on sericin and that another Research Assistant may be employed for a period of six months to work on the purification and utilisation of protein and oil derived from silkworm pupa the work being proceeded with expeditiously.

Resistance Alloys.

The Chairman explained that the Council of Scientific and Industrial Research, Government of India had

transferred the scheme for being worked out at the Mysore Iron and Steel Works (who had already done some experimental work in this direction) and that a grant of Rs. 12,200 (including recurring and non-recurring expenditure) had been sanctioned by the Council. The work was started in August 1944.

The General Manager, Mysore Iron and Steel Works explained in brief the work done so far and stated that hitherto about 15 samples had been prepared and that they had proved to be satisfactory from the forging and drawing point of view. The samples had to be drawn into a finer gauge. He stated that the Works did not have the wire drawing machine of the required gauge. He said that he was almost sure that he had struck at the proper composition of the alloy. He requested the Director, Sandalwood Oil Factory to spare the wire drawing machine that was in the Government Electric Factory for this purpose.

The Director of Sandalwood Oil Factory stated that he had large orders to be carried out for which the machine was essential and suggested that if the samples could be arranged to be sent to him, he would try to have the wire drawn and sent back.

The General Manager, Mysore Iron and Steel Works, stated that it would be very convenient if he could have the machine at the Works, but he had no objection to send the samples to the Government Electric Factory for the wires being drawn. He stated that he would submit his final report in about six months' time.

Sir J. C. Ghosh stated that the Central Board would be meeting shortly and that action had to be taken for the extension of the scheme, if it was necessary.

The General Manager replied that the Central Board had already been requested to extend the scheme and that progress had also been reported to them and requested Sir J. C. Ghosh to support the request at the meeting of the Central Board.

It was resolved that the investigations should be pursued expeditiously. The action taken by the General Manager was also approved.

Manufacture of Potassium Permanganate.

The Director of Geology stated that the necessary investigation had already been conducted successfully.

The Chairman wanted to know whether it was worthwhile taking up the scheme suggested by the Director of Engineering and Chemical Industries in view of the fact that the whole of the Indian demand was as little as about 200 tons per year and that the requirements of the State were very small. It was also a matter for consideration whether it would be worthwhile to have it as a separate industry as it was ascertained that it would not be paying to start it as a separate industry.

The Director of Industries and Commerce stated that the Board of Management for Industrial Concerns went into the matter thoroughly and had come to the conclusion that it would be better to shift the entire Government Dichromate Factory to Jog, near to the source of power supply, as it would then be more economical. He would even suggest the shifting of the ammonia plant to Jog because much depended on cheap electric power. He was of the opinion that it was no good taking up such small lines of development at Belagula and it was not profitable to instal a plant for the manufacture of potassium permanganate there.

The Chief Electrical Engineer stated that some of these industries could be worked for short periods during the year at places like Sivasamudram where secondary power could easily be made available at cheaper rates. For about seven months in the year from June to January very cheap power could be supplied at Sivasamudram and machinery utilising power to the extent of about 42,000 K. W. could be worked during that period. He was of the opinion that all the industries which could be worked for a short time during the year could be located at Sivasamudram. The Director of Industries and Commerce also agreed with the views of the Chief Electrical Engineer and suggested the appointment of a small committee to examine the details.

The Chairman observed that the General Manager, Mysore Iron and Steel Works, might investigate the matter in detail with the assistance of the special staff sanctioned for the investigation in the Jog area and forward a report in consultation with the Chief Electrical Engineer and the Director of Engineering and Chemical Industries.

It was decided that the scheme might be deferred for the present.

Manufacture of starch and glucose.

A copy of the note of the Technical Secretary of the Board on the subject had been circulated. The investigation was estimated to cost about Rs. 5,750. The Chairman stated that the Board had already investigated the possibilities of the manufacture of starch from sweet potato and the product was also got tested in the Bangalore Woollen, Cotton and Silk Mills, Ltd., and found to be good. As the raw material was not available in sufficiently large quantities in the State the matter was not pursued further.

The Director of Industries and Commerce stated that it was not advisable to take up the scheme as the raw materials thought of such as jola, maize, etc., were not grown in quantities sufficient for human consumption even.

Mr. S. L. Mannaji Rao said that the question was only one of large scale cultivation of the required raw materials and desired to know if Government would afford necessary facilities to the private people if they were to take up the industry.

The Chairman replied that it was the declared policy of Government to encourage private enterprise and that all reasonable assistance would be given to them if and when they come forward.

It was agreed that the scheme may be dropped for the present.

Manufacture of D. D. T.

The Chief Conservator of Forests explained how at the suggestion of the Board, the Forest department took up the cultivation of pyrethrum. He said that the experimental cultivation had proved very successful and that the plant was found to grow very well and also flowering according to expectations. He wanted to know whether in view of the advent of D. D. T. which was said to be four or five times more powerful than pyrethrum, it would now be advisable to take up the large scale cultivation of pyrethrum in the State.

Sir J. C. Ghosh asked whether it was necessary to grow pyrethrum hereafter, in view of the fact that D. D. T. is many times more effective than pyrethrum.

The Director of Public Health stated that the experience of the Malarialogists was that D. D. T. would

not kill the mosquito by itself quickly. Even while using D. D. T., in order to have the desired effect pyrethrum had to be mixed with it and the solution used. He said that by experience it had been found that D. D. T. required about four hours to kill the mosquito and the chances were that it was possible to communicate infection within that time. The Report of the Central Malaria Institute had recorded that D. D. T. itself could not be used with any good results unless it was mixed with pyrethrum. He stated that in Madras they had about 2,000 acres under pyrethrum cultivation. He therefore urged the immediate necessity of increasing the cultivation of pyrethrum in the State. He also added that anti-malaria operations were in progress in respect of 400 villages in the State for which about 1,500 pounds of pyrethrum were required every month and that he was already running short of pyrethrum and that the minimum requirements of the department would be about 30,000 pounds during the next year.

The Chairman read out the scheme of the Director of Engineering and Chemical Industries regarding the manufacture of D. D. T. and also said that orders had been issued regarding the conversion of the Government Industrial and Testing Laboratory into a joint-stock company and that the new concern might be requested to look into this matter.

Sir J. C. Ghosh supported the idea and said it would also be a commercially paying proposition.

It was finally agreed that the present arrangements for the cultivation of pyrethrum might continue though no expansion was called for for the present and that the scheme on the manufacture of D. D. T. might be further examined by the Industrial and Testing Laboratory, Ltd., and necessary action taken in the matter.

Manufacture of plastics from coffee beans.

The General Manager, Mysore Iron and Steel Works explained the work done so far and said that the results were not promising. His suggestion to drop the subject from further consideration was accepted.

The meeting then terminated.

T. SHAMANNA,
Secretary.

J. MOHAMED IMAM,
Chairman.

WD 2156—GPR—100—27-4-45

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE.

No. 321/DF.47-40-5 **General and Revenue Secretariat,**

Dated Bangalore, 25.7 *194 5.*

FROM

The Secretary to the Government of His Highness the Maharaja of Mysore.
Development Department.

To

The Director,
Engineering & Chemical Industries,
Bangalore.

SIR,

Sub: Manufacture of Potasium Permonganate.

With reference to the correspondence ending with your unofficial note dated 31st January 1945, requesting sanction for a grant of Rs.6,200/- to continue the investigations on the above at the Government Dichromate Factory, I am directed to invite reference to the discussion and resolution of the Board of Scientific and Industrial Research at the meeting held on 12th March 1945 and to state that the scheme might be deferred for the present, as recommended by the Board.

I have the honour to be,
Sir,
Your most obedient servant,

Secretary to Government,
Development Department.

Appendix F. G.—1]

SUBJECT Manufacture of Potassium Permanganate

6 Copies

Section D & D.F.

File No. 47-40

Serial No. 5

Diary No. of letter replied to.....

No. 321

General and Revenue Secretriat

( )

tho 194 .

To

The Director of Ercl

Sir,

With reference to the correspondence ending with your D.O. note dated 31.1.1945, asking sanction for a grant of Rs 6200/- to continue the investigations on the above at the Govt. Fisheries Factory, I am directed to convey reference to the discussion & resolution of the Board of Scientific & Ind. Research at its meeting held on 12/3/45-

Date of issue 28/8

Signed by

List of enclosures.....

Copied by.....

Examined by.....

WD 0744—GPB—15,000—30-10-44

and to state that the scheme might be defended for the present, a recommendation by the Board.

D. Ch.

TR/1/57 US

322-3 of 25/5 Devlg.

Copy to Central Dist.

" Leg. Br & Sc & Lab-Research

✓ Copy to F.L. Branch.

TR/1/57 US

2 Devlg.

11/5